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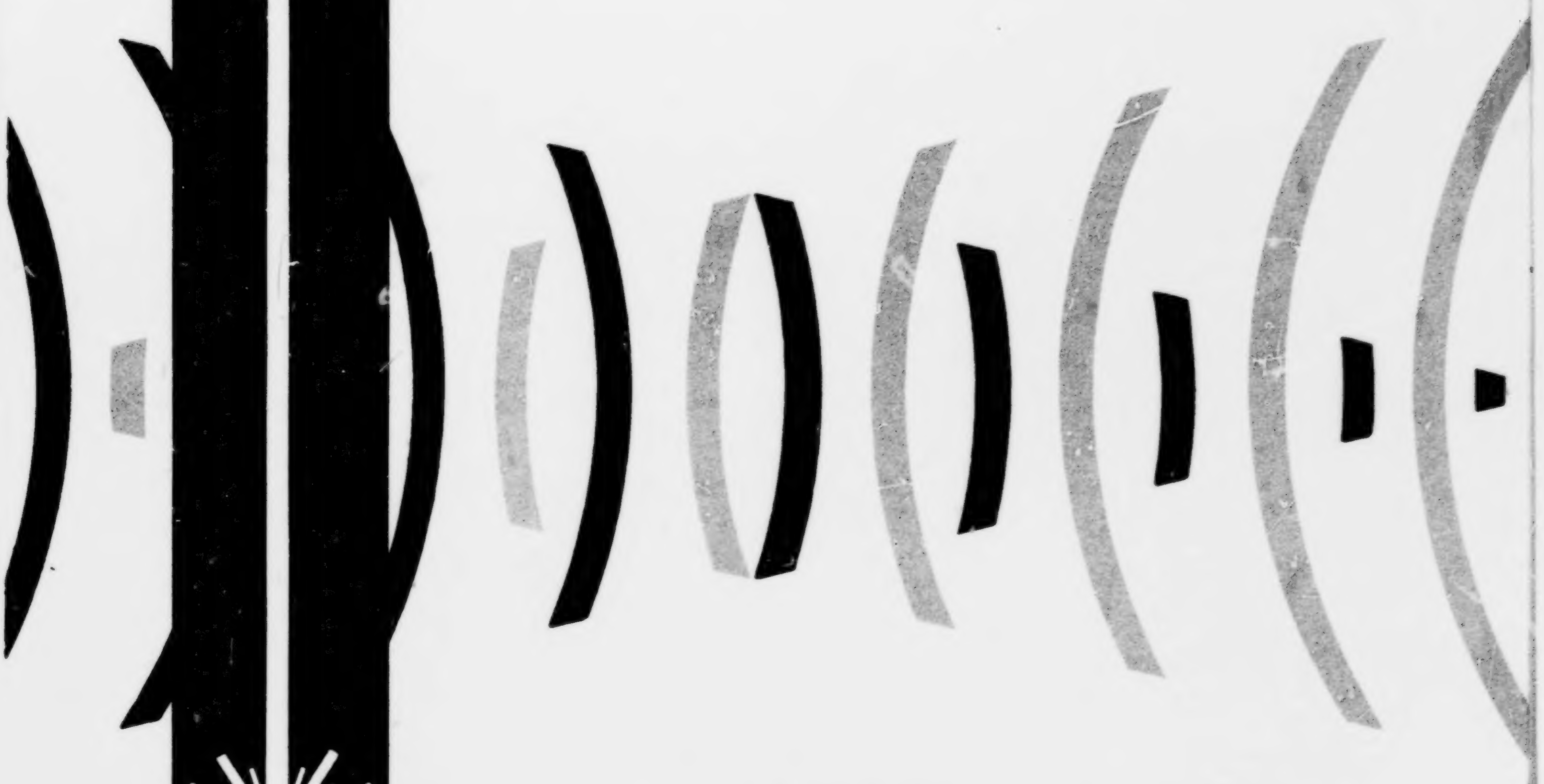
ELECTRONIC PRODUCT INVENTORY STUDY



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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DIVISION OF ELECTRONIC PRODUCTS

List of Publications

The following reports published as part of this series by the Division of Electronic Products, Bureau of Radiological Health, are available from the National Technical Information Service, Springfield, Va. 22151. Price is $3.00 for paper copy and $0.65 for microfiche. The PB number, if indicated for a report, should be cited when ordering.

	Title
TSB-1	Instrument for Measurement of X-ray Emission from Television Sets (January 1968) (PB 178 808)
TSB-2	A Pilot Survey of X-radiation Emissions from Color Television Receivers (In Pinellas County, Florida) (June 1968) (PB 178 809)
TSB-3	A Survey of X-radiation from Color Television Sets in the Washington, D.C., Metropolitan Area (March 1968) (PB 178 810)
TSB-68-4	Biological Aspects of Microwave Radiation - A Review of Hazards (July 1968) (Reprinted August 1969) (PB 185 964)
TSB-5	Report of Preliminary Measurements of Electromagnetic Radiation Fields Near Microwave Ovens (December 1968) (PB 185 967)
DEP-69-1	X-radiation Control Programs in the Color Television Industry - Summary Report on Visits to Manufacturers - May 1968-December 1968 (March 1969) (PB 185 979)
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BRH/DEP 70-9	Product Testing and Evaluation of Giant View® TV Projector (May 1970) (PB 191 906
BRH/DEP 70-10	Survey of Selected Industrial Applications of Microwave Energy (May 1970 (PB 191 394)

(continued on inside of back cover)

BRH/DEP 70-29

ELECTRONIC PRODUCT INVENTORY STUDY

Jesse Y. Harris

November 1970

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service
Bureau of Radiological Health
Rockville, Maryland 20852

The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products by the Department of Health, Education, and Welfare, Public Health Service.

FOREWORD

This report is one of a series of eight Bureau of Radiological Health staff documents used in the preparation of the "Report to the Congress on Studies Conducted Pursuant to Section 357 of the Radiation Control for Health and Safety Act of 1968, Public Law 90-602." A number of projects were established to study and report on various aspects of radiation control.

The Bureau of Radiological Health, formerly the National Center for Radiological Health, carries out a continuing national program designed to reduce the exposure of man to hazardous ionizing and nonionizing radiation.

The Bureau publishes its findings monthly in *Radiological Health Data and Reports*, Public Health Service numbered publications, appropriate scientific journals, and technical report series for the Bureau's divisions, offices, and laboratories.

The technical reports series allows comprehensive and rapid publishing of the results of intramural and contractor projects. The reports are distributed to State and local radiological health program personnel, Bureau technical staff, Bureau advisory committee members, university radiation safety officers, libraries and information services, industry, hospitals, laboratories, schools, the press, and other interested individuals. These reports are also included in the collections of the Library of Congress and the National Technical Information Service.

I encourage the readers of these reports to inform the Bureau of any omissions or errors. Your additional comments or requests for further information are also solicited.

John C Villforth

John C. Villforth
Director
Bureau of Radiological Health

PREFACE

The Division of Electronic Products (DEP), as part of its responsibility under the Radiation Control for Health and Safety Act of 1968, conducts programs to study and evaluate emissions of and conditions of exposure to electronic product radiation. In order to meet the requirements of the Act, Dr. Jesse Y. Harris of the Division of Biological Effects was assigned the task of preparing a report on the current and predicted national inventories of electronic products that may emit harmful radiation. Because of the subject matter of Dr. Harris' study and its relation to the mission of DEP, his report is being published in the DEP report series.

The study was conducted during 1969, and the inventories, estimates, and projections presented herein are based upon data gathered during that time.

Robert L Elder

Robert L. Elder, Sc.D.
Director
Division of Electronic Products
Bureau of Radiological Health

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ABSTRACT

This report presents the results of a study conducted during 1969 to determine the current and predicted national inventories of electronic products that may emit hazardous radiation. Inventories, production rates, and dollar market values are estimated to provide a general indication of the magnitude of electronic product use. Market data for various types of products which emit ionizing or nonionizing radiation are discussed in detail, growth trends are evaluated, and the future market for these products is estimated. Also included are market data for electronic components and partial listings of electronic product and component manufacturers and associations and groups related to various electronic products.

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ELECTRONIC PRODUCT INVENTORY STUDY

INTRODUCTION

This study was conducted to determine the current and predicted national inventories of electronic products that may emit harmful radiations. This information along with biological effects information is required to evaluate the present and anticipated magnitude of public health problems associated with any of the potentially hazardous electronic products.

Inventory, production rates, and dollar market estimates have been utilized in this report to give some general indication of the magnitude of electronic product use for development of public health priorities and program planning in the field of electronic product radiation control. Estimates of inventory and anticipated growth rate of some of the more significant items from the standpoint of public health are summarized in table 1. Color TV receivers outnumber all other items listed and are increasing at a relatively rapid rate. Other items such as microwave and ultrasonic devices, though presently relatively low in number, are increasing very rapidly and have a wide range of applicability for future uses. The national inventory of X-ray apparatus for both medical and and industrial uses exhibits a steady growth primarily related to increases in medical services and facilities in part responsive to the needs of population growth. Indications are that ultrasonics are rapidly replacing X-rays in a variety of uses. Laser sales appear to be increasing by about 70 percent annually. More than half of the present laser sales are helium — neon devices.

In the nonionizing radiation field, Bureau resources were used to identify sources of radiation that should be included in the study and to establish some priorities. After establishing a working list of products, other government agencies and various industry association or trade groups were contacted in quest for inventory or production rate data. Because of the time limitations and the magnitude of the problem, no attempt was made in this study to gather original survey information from the individual industries; however, specific individuals in industry believed to be leaders in their fields of technology were contacted.

Table 1. Summary of inventory estimates of selected electronic products for 1970

Product	Estimated inventory January 1970	Annual production		Estimated annual inventory growth (percent)
		Dollars	Units	
X-ray (Dental)	100,000	225,000,000	---	<5
X-ray (Medical)	115,000		---	<5
X-ray (Industrial)	15,000	30,000,000	---	<5
Accelerators	1,200	---	---	---
Color Television (Households)	24,000,000	---	6,000,000	∿25
Electron Microscopes	500	---	200	>25
Infrared Ovens (Commercial)	15,000	---	---	---
Microwave Ovens (Commercial)	45,000	---	12,000	∿25
Microwave Ovens (Domestic)	50,000	---	4,000	∿25
Microwave Heating (Industrial)	300	---	60	∿25
Microwave Diathermy Units	15,000	---	700	∿5
Microwave Communications Transmitters	66,000	---	---	---
Radar (Stationary)	5,500	(100,000,000)[a]	---	---
Radar (Pleasure Boats)	7,500	---	---	---
Transmitters (Commercial AM)	4,300	---	---	---
Transmitters (Commercial FM)	2,200	---	---	---
Transmitters (Educational FM)	400	---	---	---
Transmitters (Commercial TV)	700	---	---	---
Transmitters (Educational TV)	200	---	---	---
TV Translators and Boosters	2,200	---	---	---
Transmitters (Amateur)	6,500,000	---	---	---
Transmitters (Citizens')	300,000	---	---	---
Transmitters (Aviation Services)	200,000	---	---	---
Transmitters (Industrial Services)	1,700,000	---	---	---
Transmitters (and Transportation Services)	500,000	---	---	---

[a] All radar.

Table 1. Summary of inventory estimates of selected electronic products for 1970 (continued)

Product	Estimated inventory January 1970	Annual production		Estimated annual inventory growth (percent)
		Dollars	Units	
Transmitters (Marine Services)	200,000	---	---	---
Transmitters (Public Safety Services)	700,000	---	---	---
Laser (He-Ne)	10,000	---	5,000	∿75
Laser (Ruby)	2,000	---	600	∿25
Laser (Nd Glass)	1,000	---	600	∿50
Laser (CO_2)	1,500	---	1,000	∿50
Laser (Argon)	1,250	---	1,000	∿50
Laser (YAG)	1,000	---	1,000	∿150
Ultrasonic (Medical Diagnostic)	3,000 }	(10,000,000)	---	>50
Ultrasonic (Medical Therapeutic)	3,000		---	>50
Ultrasonic Welders	Few Thousand	---	---	>50
Ultrasonic Cleaners	Tens of Thousands	(20,000,000)	---	>10
Klystrons (Nondefense)	---	---	75,000	---
Magnetrons (Nondefense)	---	---	25,000	---

Information derived from industry surveys by other special studies was made available for this report. A partial list of electronic manufacturers and groups associated with the electronics industry are given in appendixes I and II.

For many of the electronic products included in this study, neither inventory nor unit production rate data were readily available. Often, however, various sources of market estimates were available which gave at least some indirect measure of the inventory. Table 2 lists market estimates for various electronic products and components for the years 1968, 1969, and 1972. This information was extracted from the January 6, 1969 issue of "Electronics" magazine and includes most of the items in the study.

From table 2 it is evident that electronics is a multibillion dollar industry. Equally important to the size of the industry from the public health standpoint is the expected change in the years ahead. The last column in table 2 indicates the anticipated percentage change in market value of the products for the four years from 1968 to 1972.

Some significant trends can be noted in table 2. First, the total electron tube market is expected to increase only slightly (3.6 percent). Of more specific interest to this study is the anticipated decline in power and special purpose tubes and the drastic decline in the receiving tube market. The anticipated decline of more than five percent in both the klystron and magnetron market is particularly interesting in view of the possible influence on radar and microwave heating unit production.

An anticipated drastic decline in the black and white TV picture tube market is balanced by an increase in the color tube market. The great difference in the cost of the two imply an overall reduction in the total production of TV picutre tubes. Public health priorities are presently focussed on the color tubes.

The general medical electronics market is expected to increase. Although ultrasonic devices make up only a small fraction of the total medical equipment market, both the diagnostic and therapeutic ultrasonic markets are expected to grow. A similar rapid expansion is anticipated for the microwave and short wave diathermy market.

The communications electronics market in general is expected to undergo substantial growth. Several items of particular public health interest are expected to have a growth greater than 100 percent in the four-year period from 1968 to 1972. These include microwave relay, radar, and other navigational aids such as Sonar, Loran, and Vor.

Table 2. Market estimates for various products and components 1968, 1969, and 1972[a]

Product and component	Market values in millions of dollars			Percent change 1968-1972
	1968	1969	1972	
ELECTRON TUBES, TOTAL	1,352.2	1,366.1	1,401.1	+ 3.6
Receiving Tubes	244.0	221.3	148.0	- 39.3
Power and Special Purpose Tubes, Total	296.2	295.5	308.1	+ 4.0
High-vacuum tubes	65.1	61.7	58.0	- 10.9
Gas and vapor tubes	17.6	17.0	14.8	- 15.9
Klystrons	41.4	41.0	38.6	- 6.8
Magnetrons	39.8	39.1	37.5	- 5.8
TWT's including backward wave types	54.4	54.0	59.2	+ 8.8
Light-sensing tubes	37.4	39.6	47.0	+ 25.7
Storage tubes	17.5	18.1	23.0	+ 31.4
Display tubes, except cathode ray	6.2	7.0	9.7	+ 56.5
Cathode ray tubes, except TV	16.8	18.0	20.3	+ 20.8
TV picture tubes, black and white	119.6	103.3	79.0	- 33.9
TV picture tubes, color	692.4	746.0	866.0	+ 25.1
DRY REED RELAYS	24.5	28.2	39.2	+ 60.0
Airborne, including ground links	141.3	152.6	194.0	+ 37.4
Land mobile	184.1	207.5	230.0	+ 24.9
Marine radio	21.2	24.6	32.5	+ 53.3
Microwave relay	87.5	118.3	188.0	+114.9
Amateur equipment	27.2	29.8	38.2	+ 40.4
Citizens band equipment	36.8	40.4	51.8	+ 40.8
Navigation, Total	1,127.1	1,276.0	1,725.6	+ 53.1
Radar	84.2	96.7	170.0	+101.9
Other navigational aids (Sonar, Loran, Vor)	39.4	61.7	112.0	+184.3

[a] Electronics, January 6, 1969.

Table 2. Market estimates for various products and components 1968, 1969, and 1972[a] (continued)

Product and component	Market values in millions of dollars			Percent change 1968-1972
	1968	1969	1972	
LASERS AND EQUIPMENT, TOTAL	55.2	71.6	128.3	+132.4
Gas lasers	38.4	46.8	80.0	+108.3
Ruby lasers	1.4	2.0	4.0	+185.7
Semiconductor lasers	4.7	7.8	18.4	+291.5
Liquid lasers	1.8	3.1	7.5	+316.7
Laser power supplies	3.7	5.8	8.9	+140.5
Auxiliary laser equipment, incl. nonlinear crystals	5.2	6.1	9.5	+ 81.1
INDUSTRIAL OPERATIONS ELECTRONIC EQUIPMENT, TOTAL	1,021.4	1,146.8	1,202.0	+ 17.7
Ultrasonic cleaning equipment	17.3	20.2	29.7	+ 71.7
Ultrasonic testing equipment	18.4	23.5	38.7	+110.3
MEDICAL EQUIPMENT, TOTAL	366.3	406.9	519.0	+ 41.7
Diagnostic equipment, total	251.2	275.2	349.7	+ 39.2
X-ray, fluoroscopic equipment	184.2	197.5	246.0	+ 33.6
Electroencephalographs	5.1	6.2	7.9	+ 54.9
Electrocardiographs	14.5	17.0	20.3	+ 40.0
Ultrasonic	4.8	6.4	9.1	+ 89.6
Radioactive tracer equipment	17.1	19.6	26.2	+ 53.2
Electron microscopes	9.8	11.2	15.8	+ 61.2
Analytical lab. equip,, incl. blood colorimeters	15.7	17.3	24.4	+ 55.4
Patient monitoring systems, total	16.6	21.9	34.9	+110.2
Prosthetic orthotic equipment, total	62.3	68.0	79.4	+ 27.4
Therapeutic equipment, total	36.2	41.8	35.0	- 3.3
X-ray equipment, therapeutic	26.3	29.0	36.0	+ 36.9
Ultrasonic	4.8	6.0	8.6	+ 79.2
Diathermy, shortwave and microwave	2.6	3.5	5.0	+ 92.3
Defibrillators	2.5	3.3	5.4	+116.0

---

[a] Electronics, January 6. 1969.

Table 2. Market estimates for various products and components 1968, 1969, and 1972[a] (continued)

Product and component	Market values in millions of dollars			Percent change 1968-1972
	1968	1969	1972	
COMMUNICATIONS EQUIPMENT, TOTAL	1,625.2	1,849.2	2,460.2	+ 51.4
Radio, total	498.1	573.2	734.5	+ 47.5
Infrared inspection and gauging equipment	43.0	47.8	59.0	+ 37.2
X-ray inspection and gauging equipment	27.0	30.4	41.0	+ 51.9
Nuclear gauging and processing	74.0	82.0	113.5	+ 53.4

[a] Electronics, January 6, 1969.

The total laser and laser equipment market is expected to have a growth of over 130 percent from 1968 to 1972. Ruby, semiconductor, and liquid lasers are anticipated to show the greatest increase (200 to 300 percent) during this period. This tremendous initial growth rate is expected in most new products after initial research and development stages show broad application feasibility. After a certain point, however, the market becomes saturated and the rate of expansion is much less dramatic. Certain of the electronic products of interest in this study such as laser, microwave heating devices, and ultrasonic devices appear not to have yet reached a point where market saturation has a pronounced effect on production rates. Color TV receivers, on the other hand, appear to have already reached the point where market saturation has influenced production. Recent surveys indicate that approximately 35 percent of U.S. homes presently have color TV sets. The annual increase in households with color TV sets was 81 percent in 1966, 83 percent in 1967, 49 percent in 1968, and 34 percent in 1969. This indicates that the growth rate of the color TV market has already passed through its initial exponential increase phase and has slowed to a rate typical of economic growth patterns.

SOURCES OF IONIZING RADIATION

General

Electronic products are a potential source of ionizing radiation in most aspects of our environment. Medical and dental X-ray devices are a major source of ionizing radiation exposure to the U.S. population. In an age of rapidly advancing technology, however, inventories and trends are required for many products so that public health priorities can be continually evaluated.

The values and trends given in table 2 indicate the magnitude of the market and rate of growth of various electronic products which produce ionizing and nonionizing radiation. The market for black and white TV picture tubes is predicted to decline by 34 percent from 1968 to 1972, whereas the market for color tubes is expected to increase by 25 percent. During the same tine period the market for diagnostic fluoroscopic equipment is expected to increase 34 percent, electron microscopes 61 percent, therapeutic X-ray equipment 37 percent, industrial X-ray equipment 52 percent, and industrial nuclear gauging and processing equipment 53 percent. The market predictions on X-ray devices in table 2 may be questionable because of a lack of correlation with presently observed trends in the inventory of registered X-ray devices.

X-ray Machines

Table 3 lists the 1964 – 1968 inventory for various X-ray sources. From the records available it appears that the inventory of these devices has remained relatively constant over the past few years. Medical and dental X-ray devices number slightly more than one hundred thousand units. Registered industrial X-ray devices approximate twelve thousand units. The bulk of the industrial X-ray equipment is radiographic and X-ray diffraction units. The foundry industry, reportedly one of the largest industrial users of X-ray equipment, had 683 X-ray units in 486 facilities in 1968.[1]

The very slight increase in inventory of licenses or registered X-ray equipment listed in table 3 appears to contradict the market estimates in table 2 from "Electronics" magazine where the market for X-ray equipment is estimated to increase by 30 to 50 percent. The relatively stable inventory is supported somewhat in a reply to a questionnaire by the American Society for Nondestructive Testing, Inc.[2] Concerning industrial equipment, one source states "In terms of unit sales, ultrasonic instruments outsell penetrating radiation by a factor of 10 to 1, currently. The penetrating radiation field is relatively stagnant insofar as new equipment is concerned. This, however, does not include nucleonics which is a rapidly growing field."

Particle Accelerators

Accelerators in the United States number approximately 1,100 to 1,200.[3] Trends and inventory of accelerators are concurrently being evaluated by one of the other special study groups.

Television Receivers

Table 4 gives some historical data on television receiver sales and inventory. The total U.S. sales of TV receivers increased from 5,709,000 in 1960 to 11,564,000 in 1967. During the same period imports of TV receivers increased from 7,000 to 1,614,000. Thus, imports increased from a relatively insignificant fraction to 14 percent of the total market in a period of seven years. These imports bear both foreign and domestic manufacturers' labels.

---

[1] John P. Battema, National Membership Chairman, The American Society for Nondestructive Testing, Inc. Personal Communications through Howard J. McFaul, Douglas Aircraft Co., August 1969.

[2] H. J. McFaul, Chairman Technical Council, American Society for Nondestructive Testing, Inc. Personal Communications, July 1969.

[3] Walter E. Gundaker, Chief Industrial Radiation Section, Radioactive Materials Branch, DMRE, BRH, Personal Communications, May 1969.

Table 3. X-ray inventory for Fiscal Year 1964 through Fiscal Year 1968[a]

	FY 1964	FY 1965	FY 1966	FY 1967	FY 1968
DENTAL X-RAY					
Estimated total	100,000	---	98,460	100,545	98,557
Number registered	---	82,000	90,336	91,788	81,280
MEDICAL X-RAY					
Estimated total	100,000-125,000	114,000	109,643	113,288	109,416
Number registered	---	88,419	105,622	92,211	93,233
REGISTERED INDUSTRIAL X-RAY (TOTAL REGISTERED)	---	9,566	10,169	[b]11,000[2]	[b] 9,709
Radiographic	---	---	---	4,781	4,789
Fluoroscopic	---	---	---	397	269
X-ray diffraction	---	---	---	1,566	[c] 2,436
Other	---	---	---	735	770

[a] Information from Reports of State and Local Radiological Health Programs for Fiscal Year 1964 through 1968, published by the Bureau of Radiological Health, U.S. Public Health Service.

[b] Individual types do not add up to total because in some cases the total number of machines is known, but the breakdown is unavailable.

[c] Category changed to analytical.

Table 4. Television receiver sales information[a]

	1960	1961	1962	1963	1964	1965	1966	1967
TOTAL U.S. TV RECEIVER SALES IN THOUSANDS OF UNITS	5,709	6,168	6,696	7,236	9,764	11,447	12,714	11,564
Factory sales (U.S. produced	5,702	6,145	1,537	6,845	0,049	10,399	11,190	9,950
Imports	7	23	159	391	715	1,048	1,524	1,614
Domestic label	5	10	21	174	383	704	1,011	903
Foreign label	2	13	138	217	332	344	513	711
FACTORY SALES OF TELEVISION RECEIVERS IN THOUSANDS OF UNITS (DOMESTIC LABEL)	5,827	6,302	6,996	7,766	9,432	11,103	12,201	10,853
Black and white	5,707	6,155	6,558	7,019	8,028	8,409	7,189	5,289
Color	120	147	438	747	1,404	2,694	5,102	5,564

[a] Information from Electronics Industries Association "Yearbook, 1968."

Factory sales of black and white TV receivers appeared to reach a peak of 8,409,000 units in 1965. Since then, black and white TV sales have been steadily declining. On the other hand, factory color TV sales have increased each year from 120,000 in 1960 to 5,564,000 in 1967. The 1967 color sales exceeded the black and white sales. The number of households with one or more TV receivers increased from 88 percent of the total households in 1960 to 94 percent of the households in 1967. A much more spectacular increase in homes with color TV has been observed. The number of households with color TV sets rose from 2,810,000 (4.9 percent of all households) in January of 1965 to 20,560,000 (33.6 percent of all households) in April of 1969 (table 5). At the present rate of increase in color TV households, approximately 70 percent of all homes may have color TV sets by 1975 (figure 1).

Multiple TV ownership has increased over the past several years. Table 5 shows that the percentage of homes with two or more TV sets increased from 11 percent in 1960 to 25 percent in 1967.

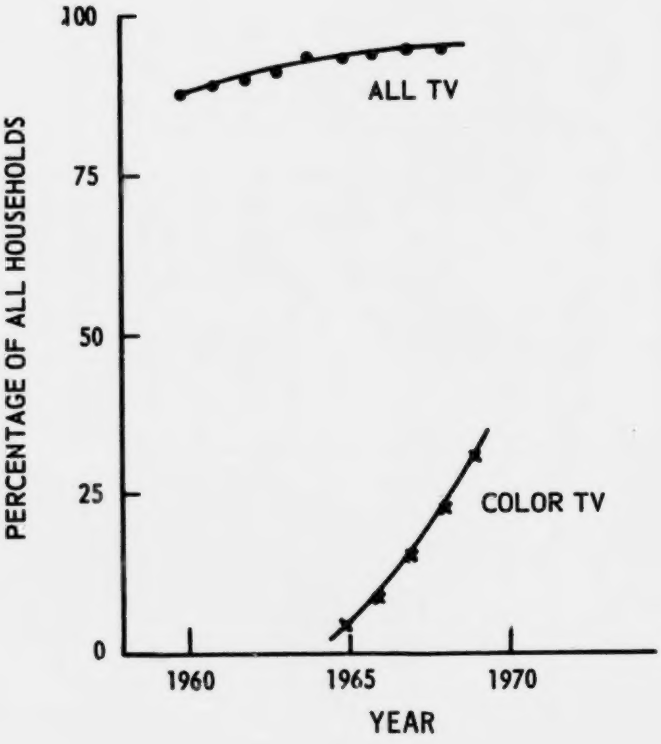

Figure 1. Percentage of U.S. households with TV receivers (1960–1969)

Table 5. Television households, 1960–1969[a]

	1960	1961	1962	1963	1964	1965	1966	1967
PERCENT OF U.S. HOUSEHOLDS WITH TV RECEIVERS								
Total Households (%)	100	100	100	100	100	100	100	100
No receivers	12	11	10	---	7	7	6	6
One or more	88	89	90	91.5	93	93	94	94
One	77	77	77	---	76	73	71	69
Two or more	11	12	13	---	17	20	23	25

	1/1/65	1/1/66	1/1/67	1/1/68	1/1/69	4/1/69
COLOR TV HOUSEHOLDS (Thousands)	2,810	5,220	9,180	14,130	19,200	20,560
COLOR TV HOUSEHOLDS AS PERCENT OF ALL TV HOUSEHOLDS	5.3	9.6	16.7	24.9	33.3	35.4
COLOR TV HOUSEHOLDS AS PERCENT OF ALL HOUSEHOLDS	4.9	9.0	15.7	23.7	31.6	33.6

[a] Information from Electronics Industries Association "Yearbook, 1968" and National Broadcasting Co. News Release 4/28/69.

Electron Microscopes

No inventory or production figures for electron microscopes have been obtained to date. Two sources of market data have been obtained for electron microscopes including the data in table 1 and the historical data on electron microscopes in table 6. Approximately 80 percent of all electron microscopes purchased in the United States are imports.[4] Many are imported duty free under the Educational, Scientific, and Cultural Materials Importation Act of 1966 (Public Law 89-651, 80 Stat.897).[5] The major sources of imported electron microscopes are Japan and the United Kingdom.

On the basis that the imports make up 80 percent of the total sales of electron microscopes in the United States, the "Electronics" magazine market estimates (table 2) appear to be unreasonably high in comparison to the Bureau of the Census Data (table 6). From the Bureau of the Census market data on imports and an assumed average cost of $30,000 per unit, a total of approximately 294 electron microscopes were imported into the United States from the years 1965 through 1968. This implies sales of about 370 units in the United States during that period. The trend indicates a rather steep increase in imports which should be close to 200 units per year by 1970.

Table 6. Electron microscope imports 1965–1968[a]

Country	1965	1966	1967	1968 Thru Nov.	1968 Est. Total
United Kingdon	$ 47,766	$ 321,734	$ 641,427	$1,022,637	$
West Germany	202,790	282,881	441,488	256,861	
Switzerland	2,919	---	65,367	---	
Japan	340,344	509,651	1,032,720	1,762,891	
Netherlands	182,497	147,714	335,883	598,373	
Austria	---	---	1,474	---	
Sweden	---	---	3,150	---	
France	54,006	6,067	32,140	3,798	
TOTAL	$836,799	$1,282,137	$2,529,397	$3,650,164	$4,294,000
Est. number[b]	28	43	84		143

[a] Source: Annual Series FT-246 Bureau of the Census, "U.S. Imports for Consumption and General Imports."

[b] Estimated number based on an assumed average cost of $30,000 per unit.

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[4] R. G. Woodbury, Scientific Apparatus Makers Association, Washington, D.C., Personal Communication, July 1969.

[5] Scientific Apparatus Makers Assoc. Newsletter, dated July 14, 1969.

SOURCES OF NONIONIZING RADIATION

General

The nonionizing radiation sources encompass several types of radiation and many different types of devices. Those items which tend to be in highest priority from a health standpoint are high-powered laser, microwave, and ultrasonic devices. The use of these items is increasing greatly in industry, science, and medicine. Various devices are also being utilized or developed for domestic appliances such as microwave ovens and ultrasonic dishwashers.

Table 2 includes market predictions for various electronic products and components capable of emitting both ionizing and nonionizing radiation. This table indicates a slight decline in the klystron and magnetron market between 1968 and 1972. Sales estimates from other sources such as the Department of Commerce tend to substantiate this prediction. This fact is difficult to reconcile with the predictions of exponential type growth of the microwave heating industry. One might assume this could be due to an anticipated reduction in radar production; however, the radar market is predicted to increase by over 100 percent in the same four-year period (table 2). While it is possible that the trends cited above could involve a cost reduction in klystron and magnetron units, it appears more likely that predictions of sales of microwave heating devices may be overly optimistic.

The market for diagnostic and therapeutic ultrasonic equipment is expected to increase by 80 to 90 percent between 1968 and 1972. Industrial ultrasonic equipment is expected to undergo a similar increase. The shortwave and microwave diathermy market is also predicted to increase by about 80 percent during the four-year period.

Ultraviolet

No estimates were obtained on the inventory of ultraviolet devices. It is probably reasonable to estimate, however, that these devices number in the tens or hundreds of thousands and are increasing. Typically, ultraviolet light sources are used in cosmetic and therapeutic sun lamps, disinfection, sterilization, and analytical instruments. These devices are widely used in homes, industries, and scientific and medical environments. A Bureau of Radiological Health Staff Report[6] and a Radiation Exposure Overview[7] on ultraviolet radiation are in preparation.

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[6] Dr. William A. Leach, DBE, BRH, "Biological Effects of Ultraviolet Light," Unpublished Review.

[7] Mr. Warren A. Brill, OCS, BRH.

Visible Light

There are numerous types of visible light, most of which are relatively innocuous. Certain high intensity light sources (producing absorbed energy levels greater than 50 calories/cm^2/min)[8] may cause eye injury. No estimates were obtained on the possible number of devices capable of delivering this amount of energy to the eye; however, items which would probably fall in this category include high intensity reading lamps, movie and slide projector bulbs, spot lights, flood lights, and so forth. These items, like ultraviolet devices, probably number in the tens of thousands or even millions.

Infrared

"Exposures to infrared can occur in almost any indsutry. Sources of infrared are not only from sources designed to emit infrared but also from other heat sources. The more common industrial exposures are found in the hot metal operations, glass making, photoengraving, paint and enamel drying, and welding. However, with our rapidly developing technology, the number of potential sources is increasing daily."[8] Infrared is also used for cooking in both homes and commercial establishments. The results of an inventory survey in 1966 indicated that there were over 371,000 food service establishments in the United States.[9] Of 6,021 establishments surveyed, 3.3 percent had operational infrared ovens. The national inventory was estimated to be 13,400 ovens. Table 7 shows the use of these ovens by type of food service establishment, and table 8 shows the use by size of the establishment measured in dollar value of sales. The data in table 8 tend to indicate no particular trend in the percentage of public eating establishments utilizing infrared ovens when ranked according to size of business. On the other hand, a trend is obervedsin institutions with food service. Less than 1.5 percent of those with less than $100,000 gross food sales had infrared ovens, whereas over 7.5 percent of those institutions with gross sales greater than $100,000 had infrared ovens.

Microwave

Microwave radiation is emitted from a variety of devices including diathermy units, ovens, heating devices, television, communication, and radar units. One estimate indicates that about one in six of the approx-

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[8] Dr. DeWitt G. Hazzard, "Biological Effects of Visible and Intrared Radiations," Unpublished.

[9] Van Dress, M. G., and Freund, W. H. "The Food Service Industry: Its Structure and Characteristics, 1966," USDA Statistical Bulletin No. 416, February 1968.

Table 7. Infrared ovens in public eating establishments and institutions with food service, 1966[a]

	Number of establishments	Number[b] of infrared ovens	Percent with infrared ovens[c]
PUBLIC EATING PLACES			
Separate eating places	201,734	3,700	1.6
Separate drinking places	51,644	3,100	5.9
Drug or proprietary stores	12,013	1,200	9.8
Retail stores	22,820	1,200	5.2
Hotels, motels, or tourist courts	16,558	300	1.9
Recreation and amusement places	19,411	1,700	8.3
Civic, social, or fraternal associations	4,355	100	1.1
Factories, plants, or mills	6,784	900	8.8
Other public eating establishments	8,429	200	2.1
TOTAL	343,749	12,400	3.3
INSTITUTIONS			
Hospitals	5,931	800	8.1
Sanatoria, convelescent, or rest homes	5,118		0.0
Homes for children, the aged, handicapped, or mentally ill	4,092	100	1.1
Colleges, universities, professional or normal schools	2,766	100	4.0
Other institutions	9,738	100	0.9
TOTAL	27,645	1,000	2.8
GRAND TOTAL	371,394	13,400	3.3

a. M. G. Van Dress and W. H. Freund. "The Food Service Industry: Its Structure and Characteristics, 1966," Statistical Bulletin No. 416, USDA, February 1968.

[b] Because of rounding, indicated items may not add to totals.

[c] Those having one or more.

Table 8. Infrared ovens by size of business in eating establishments, 1966[a]

	Gross food sales (percent having infrared ovens)					
	Less than $20,000	$20,000 — $49,999	$50,000 — $99,999	$100,000 — $299,999	$300,000 — and over	Average
Public eating establishments	4.4	2.4	2.2	4.0	2.6	3.3
Institutions	1.2	0.7	1.4	7.4	8.7	2.8

[a] M. G. Van Dress and W. H. Freund. "The Food Service Industry: Its Structure and Characteristics, 1966," Statistical Bulletin No. 416, USDA, February 1968.

imately 7,000 hospitals in the United States may have microwave diathermy units (est. approx. 1,200 units).[10] A second source[11] indicates that 3,625 domestic microwave diathermy units (2,450 MHz) were shipped by the Burdick Corporation of Milton, Wisc. during 1964-1968 inclusive. The Burdick units are the only microwave diathermy units produced for medical purposes in this country. This source further estimated that a twenty-year longevity of these devices should be conservative. On that basis, if it is assumed that most units in this country are of domestic origin one might estimate the current inventory of microwave diathermy units to be in the neighborhood of 10 to 15 thousand units.

Department of Commerce statistics indicate a decreasing trend in shipments of diathermy equipment (figure 2) whereas "Electronics" magazine predicts that the shortwave and microwave diathermy market will increase 80 percent between 1968 and 1972 (table 2). Since neither the Commerce or "Electronics" statistics individually identify microwave diathermy information they cannot be used readily for cross-checking purposes. It does appear, however, that the total number of these devices is not rapidly increasing. The average annual domestic shipments appear to be approximately 700 units; if one-half of these go for replacement purposes then the estimated present 10 to 15 thousand units would represent an increase of about 3 percent per year.

Microwave ovens were first introduced in the late 1940's and originally sales were directed toward food service establishments. A 1966 survey indicated that there were approximately 7,700 microwave ovens (1 to 2 kW) in food service establishments.[12] Thus, approximately 2 percent of these establishments had microwave ovens; however, commercial microwave oven sales are predicted to increase to about 14 million dollars by 1970.[13] It has further been indicated that since 1965, monthly sales have approached 1,000 ovens with the majority of these going to the vending trade. If this is true, then an estimated inventory of commercial ovens for January 1970 should be close to 45,000 units. A linear extrapolation based on sales of 1,000 units per month would produce an inventory estimate of approximately 100,000 units by 1975.

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[10] Lucy Blair, Executive Director, American Physical Therapy Association, Personal Communications, June 1969.

[11] Creston D. Herold, Executive Director, American Academy of Physical Medicine and Rehabilitation, Personal Communications, July 1969.

[12] M. G. Van Dress and W. H. Freund. "The Food Service Industry: Its Structure and Characteristics, 1966." USDA Statistical Bulletin No. 416, February 1968.

[13] Jane Young Wallace, Editor-in-Chief, Institutions, Magazine of the Food Service World, Personal Communications, June 1969.

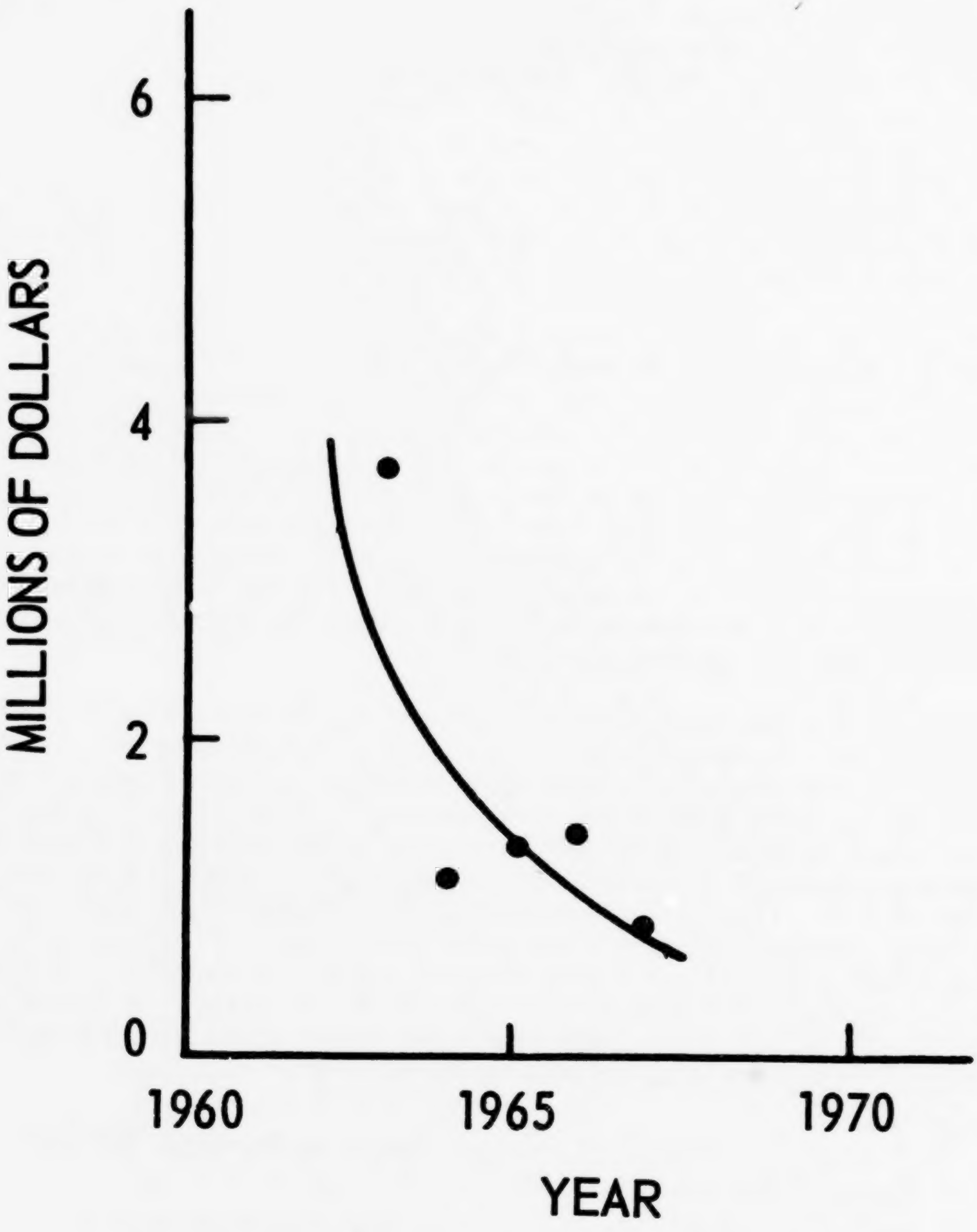

Figure 2. Shipments of diathermy equipment 1963–1967[a]

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[a] Information from the Department of Commerce Current Industrial Reports, MA-36N.

Table 9 shows the 1966 distribution of microwave ovens in public eating places and institutions. From this table certain of the eating places tend to have higher percentages with microwave ovens than the others. These are hotels, motels, or tourist courts (4.3 percent), factories, plants, or mills (5.3 percent), other public eating places (includes vending) (5.2 percent), hospitals (5.9 percent), and colleges, universities, professional or normal schools (4.0 percent). Because of the relatively small number of hospitals (approximately 7,000), and the relative ease with which initial mail contacts could be made, the use of microwave ovens in hospital food service over a long period of time[14] would make an ideal pilot survey group for documenting information on radiation emission of ovens of various makes and ages.

Table 10 shows a positive correlation between the gross value of food sales and the percentage of both public and institutional establishments utilizing microwave ovens in 1966. In the public eating places the percentage with microwave ovens ranged from 0.7 percent in the less than $20,000 gross sales group to 11.5 percent in the $300,000 and over group. In the institutions it ranged from 1.2 percent in the less than $20,000 group to 8.7 percent in the $300,000 and over group. The much smaller total number of institutions, however, reduces the confidence one can place in these sample statistics. This is illustrated in the fact that the $20,000 to $49,999 sample group had only 0.7 percent and the $50,000 to $99,999 sample group had no microwave ovens.

The relatively high percentage of microwave ovens in the category "Factories, Plants, or Mills" in table 9 is probably related to their use with vending operations. Over 60 percent of industrial respondents to the U.S.D.A. survey indicated the use of vending machines for soups, other hot canned foods, and sandwiches.

Assuming one magnetron is used per commercial oven, about 12,000 magnetrons per year are going into these units according to previously mentioned estimates. If all of the remaining nonmilitary magnetron shipments go into home microwave ovens (which is unlikely), this would be about 8,000 units per year. On this basis there appears to be a wide gap between the estimates of the sales of ovens and heating devices and shipments of the magnetrons which are the essential components. The Department of Commerce statistics on items identified as industrial dielectric heating equipment and commercial electronic stoves and ovens actually show a drastic reduction in the dollar value of shipments from 1963 through 1966 (figure 3). These items were dripped from the statistics after 1966. Estimates of sales of home microwave ovens through August of 1968 are given in table 11.

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[14] Jean Bechtel, "Electronic Oven Speeds Service of Tasty Hospital Food," J Amer Dietetic Assoc. March 1959.

Table 9. Microwave ovens in public eating establishments and institutions with food service, 1966[a]

	Number of establishments	Number[a] of microwave ovens	Percent with microwave ovens[c]
PUBLIC EATING PLACES			
Separate eating places	201,734	3,800	1.6
Separate drinking places	51,644	500	0.8
Drug or proprietary stores	12,013	100	0.3
Retail stores	22,820	200	0.8
Hotels, motels, or tourist courts	16,558	800	4.3
Recreation and amusement places	19,411	200	0.7
Civic, social, or fraternal associations	4,355	100	1.1
Factories, plants, or mills	6,784	800	5.3
Other public eating establishments	8,429	400	5.2
TOTAL	343,749	6,900	1.6
INSTITUTIONS			
Hospitals	5,931	600	5.9
Sanatoria, convalescent, or rest homes	5,118	100	1.6
Homes for children, the aged, handicapped, or mentally ill	4,092	0	0.0
Colleges, universities, professional or normal schools	2,766	200	4.0
Other institutions	9,738	0	0.0
TOTAL	27,645	900	2.2
GRAND TOTAL	371,394	7,700	1.7

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[a] M. G. Van Dress and W. H. Freund. "The Food Service Industry: Its Structure and Characteristics, 1966," Statistical Bulletin No. 416, USDA, February 1968.

[b] Because of rounding, indicated items may not add to totals.

[c] Those having one or more.

Table 10. Microwave ovens by size of business in eating establishments, 1966[a]

	Gross food sales (percent having microwave ovens)					
	Less than $20,000	$20,000 — $49,999	$50,000 — $99,999	$100,000 — $299,999	$300,000 — and over	Average
Public eating establishments	0.7	0.7	1.8	4.8	11.5	1.6
Institutions	1.2	0.7	0.0	4.9	8.7	2.2

[a] M. G. Van Dress and W. H. Freund. "The Food Service Industry: Its Structure and Characteristics, 1966," Statistical Bulletin No. 416, USDA, February 1968.

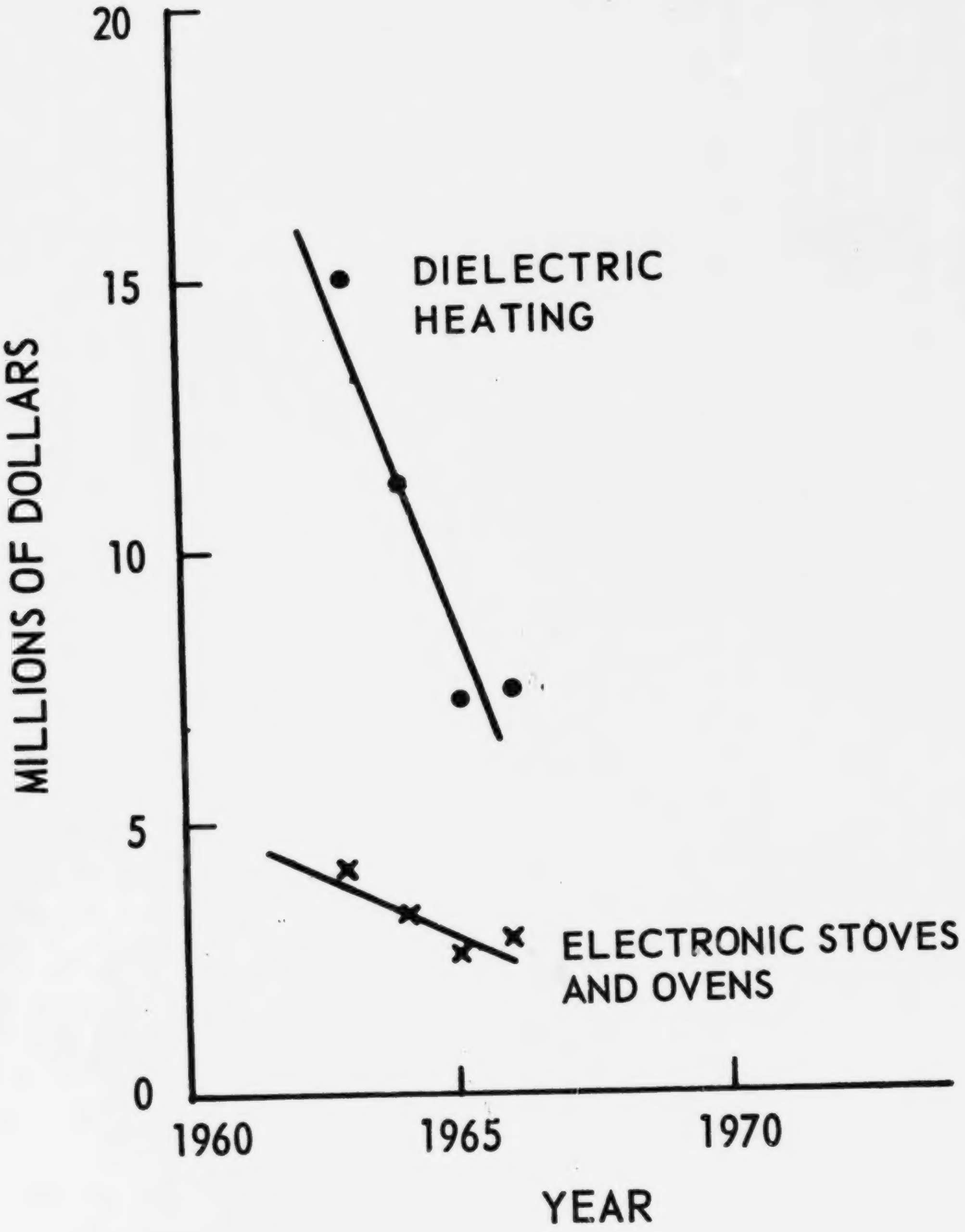

Figure 3. Shipments of industrial dielectric heating equipment and commercial electronic stoves and ovens, 1963–1966[a].

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[a] Information from the Department of Commerce Current Industrial Reports, MA36N.

Table 11. Home microwave oven sales through August 1968[a]

Year	Rough totals
1968 to date	2,000
1967	3,500
1966–1965	6,000
1964 and prior	10,500
TOTAL	22,000

(Not included in these statistics are the sales of Amana Corp.).

[a] Estimates by Association of Home Appliances Manufacturers as indicated in trip report of Donald R. Smith, BRH, USPHS, August 21, 1968.

Recent estimates of market trends for home microwave ovens indicate that the market will gorw from its 2 million dollar value in 1965 to 100 million dollars in 1975.[15] It is further estimated that during that ten-year period nearly one-half million units will be sold. Indications that Japanese firms are seeking approval for export to the United States of a more economical home microwave oven adds to the credibility of a massive increase in the use of microwave ovens in U.S. homes;[16] however, there still appears to be a gap. If these industry predictions come to pass, it will mean a phenomenal increase in microwave oven production after 1970. From current information the U.S inventory of home microwave units will be in the neighborhood of 50,000 units as of January 1970. Based on an average oven price of $500 and the quoted market predictions, a mathematical formula was derived to describe the anticipated exponential sales trend:

$$\text{Annual Oven Sales} = 4000\, e^{.391t}$$

where t is the number of years after 1965. Estimated yearly sales obtained utilizing this model are shown in table 12. If these predictions are true, then some anticipation of this should be indicated in the Department of Commerce quarterly reports on shipments of magnetrons (fig. 4). The average yearly nonmilitary shipments of magnetrons have increased since 1965 from 10,000 units per year to about 20,000 units per year for 1966, 1967, and 1968.[17]

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[15] Jane Young Wallace, Editor-in-Chief, Institutions, Magazine of the Food Service World, Personal Communications, June 1969.

[16] "Hayakawa to Range in U.S. Oven Market," Electronics, December 23, 1968, page 132.

Table 12. Estimated annual sales of home microwave ovens (1965 – 1975) based on an exponential model

Year	Home microwave oven sales
1965	4,000
1966	5,908
1967	8,720
1968	12,880
1969	19,040
1970	28,400
1971	41,520
1972	61,320
1973	92,000
1974	132,800
1975	200,000

Microwave power for industrial heating purposes is presently in an experimental stage, though the industry again appears to be predicting exponential growth. Industrial units tend to produce an average power of about 25 kW per unit[18] as compared to about 1 to 2 kW for commercial ovens and about 0.5 to 1 kW for domestic ovens. Power levels range from 1 to 200 kW for industrial units depending on the application. Some of the present uses of microwave heating in industry are shown in table 13. Most articles discussing microwave power use tend to resemble "get on the bandwagon" type advertising campaigns. Solid statistical facts are difficult to obtain. One of the larger producers of this equipment[19] estimates that there are approximately 270 units presently installed and the current rate of production is approximately 5 units per month. They estimate that there will be approximately 600 to 800 units in use in 1974.

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[17] Source of information: Consolidated Tabulation, Shipments of Selected Electronic Components for Calendar Years 1960-1967, U.S. Department of Commerce.

[18] Manfred Meisels, "Industry Warming to Microwave Power," Microwaves, May 1968, pages 10-17.

[19] John W. Gilpin, Director, Governmental Affairs, Varian Corp., Personal Communications, August 1969.

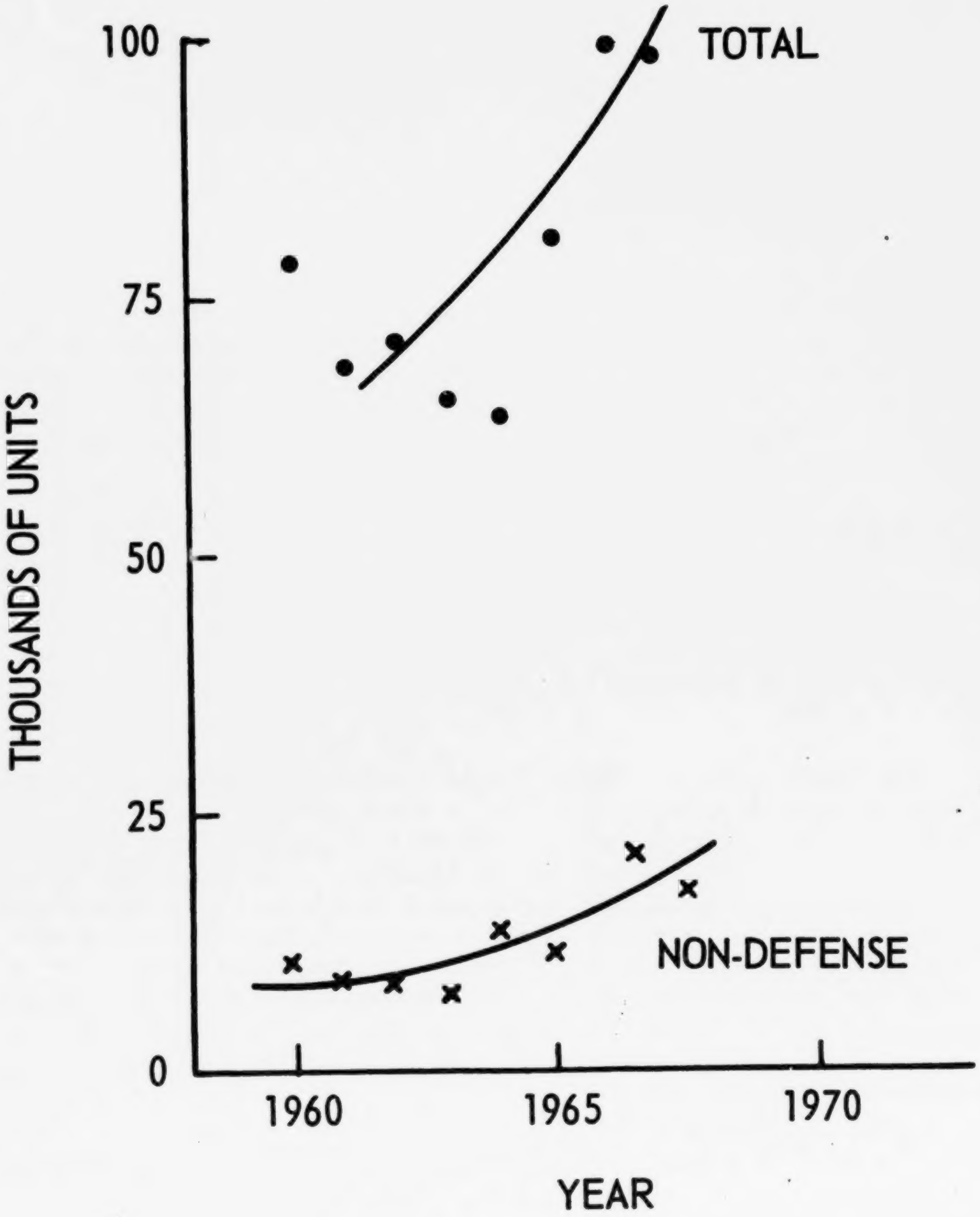

Figure 4. Shipments of magnetrons 1960–1967[a]

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[a] Source: Consolidated Tabulation Shipments of Electronic Components for Calendar Years 1960-1967, U.S. Department of Commerce.

Table 13. Some industrial uses of microwave heating

Wood Drying	Chicken Processing
Paper Drying	Pre-Cooked Bacon
Film Drying	Baking
Ink Drying	Plastic Curing
Potato-Chip Cooking	Sterilization

Microwave equipment is also used in nondestructive testing. The estimated value of flaw detection and thickness measuring devices utilizing microwaves is between $500,000 and $1,000,000 excluding moisture gauges and microwave dielectrometers. There are probably fewer than 200 units (exclusive of moisture gauges and dielectrometers) in the United States.[20]

Various remote control devices are reported to be microwave activated. Such items as TV remote control devices, remote control garage door openers, and burglar alarms fall into this category. No inventory information was obtained on these devices. Their extremely low power and relatively short operating cycle make them of relatively low priority as public health problems. These devices may, however, total in the millions of units.

Microwave communications transmitters are used mainly in the telecommunications industry. There is a total of 65,904 transmitters in the United States with an average of about 6 frequencies per transmitter. The total number of frequencies is 386,054.[21] Many new and novel uses are being developed for microwave power which may have future potential for widespread use. One such device is a microwave blood warmer.[22] Although only five units are presently in hospitals undergoing a testing period, the manufacturer feels that in the near future most hospitals may utilize them. Other items such as microwave powered helicopters, high-speed trains and rockets,[23] though indicated to be possible, may be more futuristic.

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[20] Howard J. McFaul, Chairman, Technical Council, The American Society for Non-Destructive Testing, Inc., July 1969.

[21] Data obtained from ECAC, DOD, Computer Center, Document DB-343.

[22] Charles J. Restall, M.D., et al., "A Microwave Blood Warmer: Preliminary Report, Anesthesia and Analgesia...Current Researches," Vol. 46, No. 5, September-October 1967, pages 625-628.

[23] Manfred, Meisels, "Industry Warming to Microwave Power," Microwaves, May 1968, pages 10-17.

Radar units come in a wide range of power levels and are utilized in both fixed ground installations such as airports and in mobile stations such as marine or air transportation units. Table 14 shows the current inventory of fixed radar installations in the United States. Figure 5 shows the 1960 – 1967 shipment of klystrons, which should have some bearing on the production of radar during that time.

Table 14. Inventory of fixed radar installations, 1969[1]

Agency	Number of units
Air Force	1,452
Army	1,684
Marine Corps	203
Navy	727
FAA	1,003
NASA	21
CG & Treasury	139
Weather Bureau	96
TOTAL	5,325

[1] Data obtained from ECAC, DOD, Computer Center, Document DB-343.

The mobile units probably far outnumber the fixed; however, complete inventory information has not been obtained to date.

The Coast Guard Auxiliary made an inventory survey of equipment carried aboard recreational boats in 1967 which indicated an estimate of over 7,000 radar units on recreational boats.[24] Over 18 percent of the boats in class 3 (40 to 65 feet) were equipped with radar units. This information is summarized in table 15.

Table 15. Inventory of radar on recreational boats, 1967

Class of boat	Total number in class (1967)	Total in sample	Total radars in sample		Extrapolated total radars
			Number	Percent	
1 (16 – 26 ft.)	1,200,000	2,405	5	0.2	2,400
2 (26 – 40 ft.)	149,000	2,444	35	1.4	2,140
3 (40 – 65 ft.)	14,000	398	73	18.3	2,560

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[24] S. G. Putzke, U.S. Coast Guard, Personal Communications, July 1969.

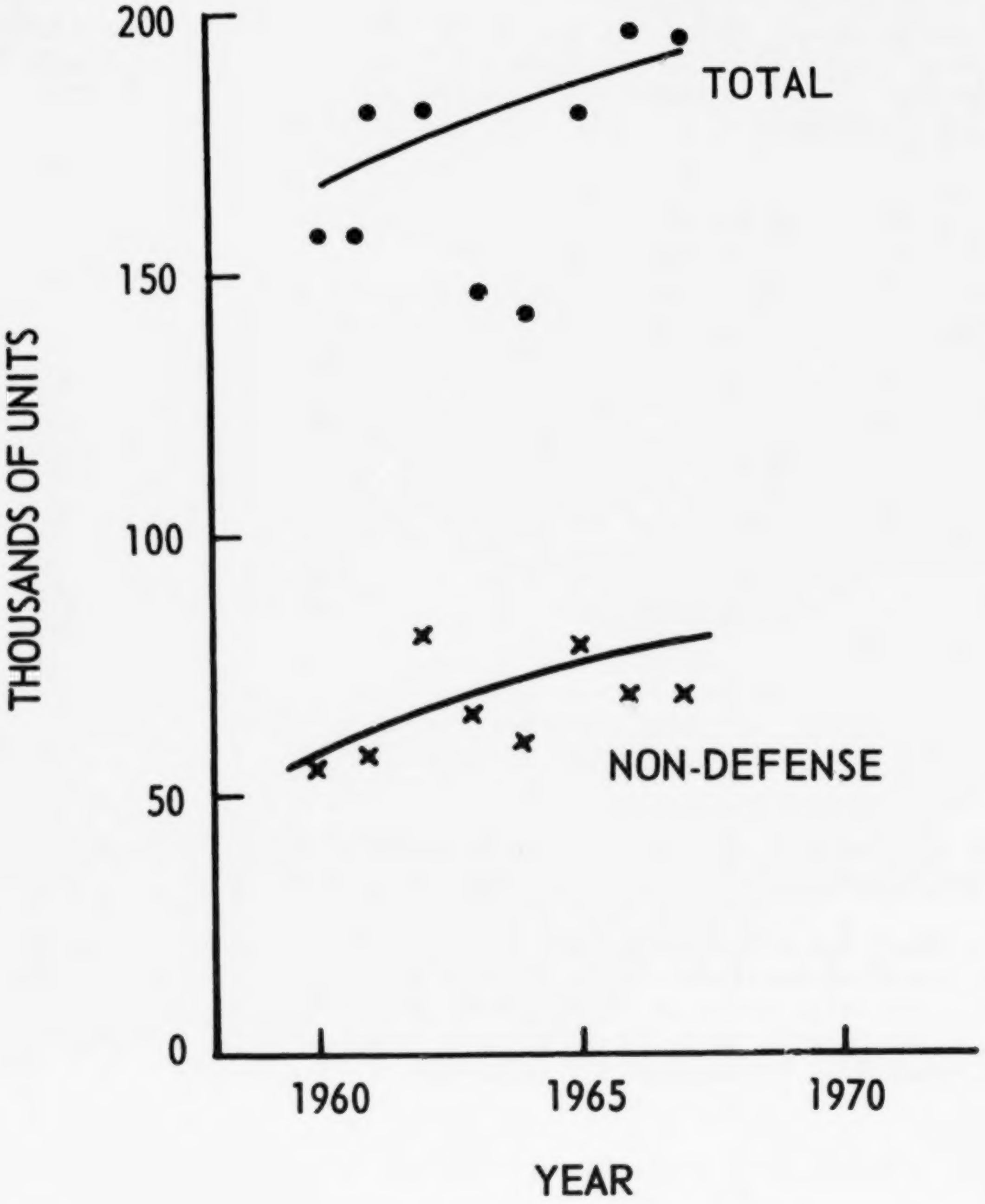

Figure 5. Shipments of klystrons 1960–1967[a]

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[a] Source: Consolidated Tabulation of Shipments of Electronic Components for Calendar Years 1960–1967, U.S. Department of Commerce.

Radio and Low Frequency Radiation

Radio and low frequency radiation emitters usually include transmitting devices; however, this frequency has also been utilized in medical diathermy units. A historical summary of the total number of broadcast stations on the air (1960 – 1969) is given in table 16.

"Radio low frequency diathermy units continue to be used in many settings including hospitals, physicians' offices, treatment centers, and athletic departments of secondary schools, colleges, or universities. They are handled by all types of personnel. Also, they are used by other disciplines not identified with organized medicine."[25] Although no inventory estimates are presently available it might be estimated that there are several thousands of these devices in this country.

Broadcast stations, boosters, and transmitters in safety and special radio services make the greatest contribution to the observed ambient radiation levels in the radio frequency range. Table 16 shows the inventory of broadcast stations and other transmitters from 1960 through 1969. The April 30, 1969, inventory indicates a total of 6,613 radio and 855 television broadcast stations. In 1967 there were 2,026 TV translators and boosters and a total of over six million transmitters in safety and special radio services.

Surveys of licensees in the Amateur Radio Service indicate that between 50 and 60 percent are active at any one time – meaning possessing a transmitter capable of immediate operation. Thus, of the approximately 300,000 amateur transmitters about 150,000 would be classified as active. The maximum legal power for amateurs is 1,000 watts and surveys in the past have indicated an average power level of around 300 watts.[26]

The average power of mobile units utilized in Forest Industries ranges from 25 to 100 watts. Power output of the land station transmitters range from 60 to 250 watts and transmitter towers are elevated from 25 to 600 feet above the ground. This industry also uses a few hand carried sets of approximately 1/2 watt output when patrolling or fighting forest fires.[27]

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[25] Lucy Blair, Executive Director, American Physical Therapy Association, Personal Communications, June 1969.

[26] John Huntoon, General Manager, WILVZ, Personal Communications, May 1969.

[27] Elmer L. Surdam, Manager, Forest Industries Radio Communications, Personal Communications, May 1969.

Table 16. United States broadcast stations (total on air) 1960–1969[a]

	1960	1961	1962	1963	1964	1965	1966	1967	1969[b]
Commercial AM	3,483	3,602	3,745	3,860	3,976	4,025	4,075	4,135	[c]4,250
Commercial FM	741	889	1,012	1,120	1,181	1,343	1,515	1,708	[d]1,993
Educational FM	165	186	201	221	243	262	291	318	370
Commercial TV	579	553	571	581	582	589	613	626	[e]678
Educational TV	47	54	59	70	79	92	108	127	177
TV translators and boosters	233	279	487	1,028	1,415	1,762	1,894	2,026	
Transmitters in safety and special radio services	-	-	-	-	-	-	5,615,953	6,053,894	-
Amateur and disaster services							292,194	283,412	
Citizens							2,561,363	2,718,505	
Aviation services							169,034	196,723	
Industrial services							1,400,231	1,551,410	
Land transportation services							446,214	489,835	
Marine services							149,629	174,454	
Public safety services							597,288	639,555	

[a] Data from Electronics Industries Association "Yearbook 1968."

[b] Figures as of April 1969 from Federal Communications Commission News Release, May 16, 1969.

[c] Includes 25 educational stations.

[d] Includes 15 educational stations on nonreserved channels.

[e] Includes eight educational stations on nonreserved channels.

Although broadcast stations are regulated by the Federal Communications Commission this is mainly to prevent mutual interference of broadcast activities. The various regulations reflect this philosophy. For instance, no minimum antenna height is specified for TV transmitters; however, both maximum height and power are specified to limit transmission area. Table 17 gives a summary of specifications for various broadcast stations. The specifications for UHF TV stations (channels 14 through 83) could lead to ground level radiation in excess of 2 mW/cm^2. Further, it is possible that radiation levels in tall buildings in the vicinity of buildings supporting transmitter towers may be considerably higher than 2 mW/cm^2. Although radio frequency radiation is generally considered less of a biological hazard than microwave radiation,[28,29] Russian workers claim to have observed biological effects in the environs of various broadcast transmitters.[30]

UHF transmitters appear to possess the greatest potential for producing biological hazards. Since they are relatively few in number, the environs of these transmitters might be a feasible subject for possible preliminary physical and later epidemiological surveys. Statistics as of December 31, 1968, indicate that 109 (approximately 22 percent) of the 496 UHF TV broadcast stations on the air, authorized or applied for as of that date, employ or propose an effective radiated power greater than 1 megawatt.[31] Further study of this situation appears warranted. Other types of broadcast stations would appear to be less of a public health problem due to the lower power levels and the longer wavelengths of the radiations.

Coherent Electromagnetic Radiation

This category of products includes both laser and masers. Both are relatively new products for general industrial use. Lasers have undergone an extensive research and development stage which has produced many promising uses such as those listed in table 18.

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[28] Ulrich H. Behling, DBE, BRH, "Biological Effects of Radio and Low Frequency Electromagnetic Radiation," Unpublished Review.

[29] Wellington Moore, Jr., "Biological Aspects of Microwave Radiation, A Review of Hazards," U.S. Department of Health, Education, and Welfare, July 1968.

[30] N. N. Goncharove, et al., "Industrial Hygiene Problems of Working with Ultra Short-Wave Transmitters Used in Television and Radio Broadcasting," Translation – ATD, Report 66-125, September 27, 1966.

[31] Comments of Association of Maximum Service Telecasters, Inc., before to Federal Communications Commission, Washington, D.C. 20554, February 3, 1969, Part III, Exhibits C through G.

Table 17. Broadcast transmission standards 1968[a]

Type station	Service area	Operating power level (kilowatts)	Maximum antenna height (feet above average terrain)
AM radio			
Local	Small communities	0.25 to 1.0	
Regional	Centers of populations & surrounding areas	0.5 to 5.0	
Clear Channels	Large area coverage, particularly at night	10.0 to 50.0	
FM radio			
Noncommercial	Schools, and so forth	0.01 to 0.1	
Class A	Radius about 15 miles	0.10 to 3.0	300
Class B	Radius about 40 miles	5.00 to 50.0	500
Class C	Radius about 65 miles	25.00 to 100.0	2,000
Television			
Channels 2 – 6			
Zone I		to 100	1,000
Zones II & III		to 100	2,000
Channels 7 – 13			
Zone I		to 316	1,000
Zones II & III		to 316	2,000
Channels 14 – 83			
Zone I		to 5,000	1,000
Zones II & III		to 5,000	2,000

[a] Information from "Broadcasting, 1968 Yearbook."

Table 18. Major uses of laser devices

Commercial functions	Military functions
Displays	Communications
Data Processing	Countermeasures
Education	Fire Control
Geodesy	Navigation
Industrial Processes	Ranging
Medical Equipment	Tracking, Guidance and Target Designation
Metrology	
Meteorology	Reconnaissance and Surveillance
Recording	

Table 19 contains estimated sales of laser products from 1963 through 1968. During this period an estimated eighteen thousand lasers were sold in the United States, with Helium – Neon lasers amounting to about 62 percent of the total units sold. Ruby lasers made up about 12 percent and the remainder were rather evenly divided between the later arrivals including Nd Glass, CO_2, Argon, and YAG. The cumulative laser sales through 1970 could be in the neighborhood of 50 thousand units based on current statistics and trends. The inventory of operable devices should be considerably less, however. Information on useful life of the various laser devices would be required to estimate the inventory from annual sales data.

Table 19. United States sales of laser products 1963–1968[a]

Type	Estimated number of lasers						Cumulative through 1968	
	1963	1964	1965	1966	1967	1968	Number	Percent
Nelium-Neon	200	500	1,150	1,800	2,700	4,700	11,150	62
Ruby	175	250	325	350	425	550	2,075	12
Nd Glass	25	50	130	200	300	450	1,155	6
CO_2	--	--	25	125	550	800	1,500	8
Argon	--	--	60	150	425	700	1,335	7
YAG	--	--	10	75	200	500	785	5

[a] Values estimated on the basis of trends given in "Laser Market Data" (Graphic Report), October 1968 and "R & D Systems Sales, Lasers and Accessories Sales (1965, 1966, First Half of 1967, Second Half 1967, First Half of 1968," issued May 15, 1969 by the Electronic Industry Association.

An inventory estimate of 9,400 commercial laser units in the United States has been made for 1968.[32] This estimate is about 50 percent of the cumulative total sales estimate through 1968 given in table 19.

Sales have apparently been increasing annually at an exponential rate (70 percent annually) since 1963 according to an EIA survey.[33] The dangers of extrapolation of an exponential model too far into the future have been discussed earlier; however, an estimate of sales in excess of 10,000 units per year may be reasonable for 1970 (fig. 6).

Ultrasonics

Although ultrasonics is a relatively new energy source, its versatility has led to its widespread employment in various industrial, medical, scientific, and consumer products. The most important and successful industrial applications for ultrasonics can be divided into two distinct categories: (1) applications utilizing low power for measurement and control; and (2) applications utilizing high power to modify the material by the dissipation of energy. The low power nondestructive test applications utilize the higher frequencies. Procedures requiring the high power with significant energy dissipation operate best at lower frequencies (table 20). "It must be kept in mind that the energy used in most industrial applications is several million times greater than that radiated by an average radio loudspeaker. Hence, for convenience, comfort, and safety, the majority of industrial applications make use of 'ultra'-sonic frequencies."[34]

A recent market analysis predicts an increase in the ultrasonics market from about $50 million a year in 1968 to about three times that by 1973.[35] From the summary given in table 21 the greatest percentage increase is the predicted 100-fold increase for consumer products going from a $100 thousand market in 1968 to a $10 million market in 1973. Department of Commerce statistics show a relatively steep increase in shipments of industrial ultrasonic equipment from 1963 through 1967 (fig. 7).

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[32] M. E. LaNier, V. E. Rose, and C. H. Powell, "Occupational Health Survey of the Use of Laser," DHEW, TR-63, January 1969.

[33] "R & D, Systems Sales, Laser and Accessories Sales (1965, 1966, First Half of 1967, Second Half of 1967, First Half of 1968)," Issued May 15, 1969, by the Electronic Industry Association.

[34] E. B. Steinberg, "Ultrasonics in Industry," Proceedings of the IEEE, Vol. 53, No. 10, October 1965, page 1292.

[35] Information from "Ultrasonics and Quiet Boom," Dun's Review, September 1968, pages 105-112.

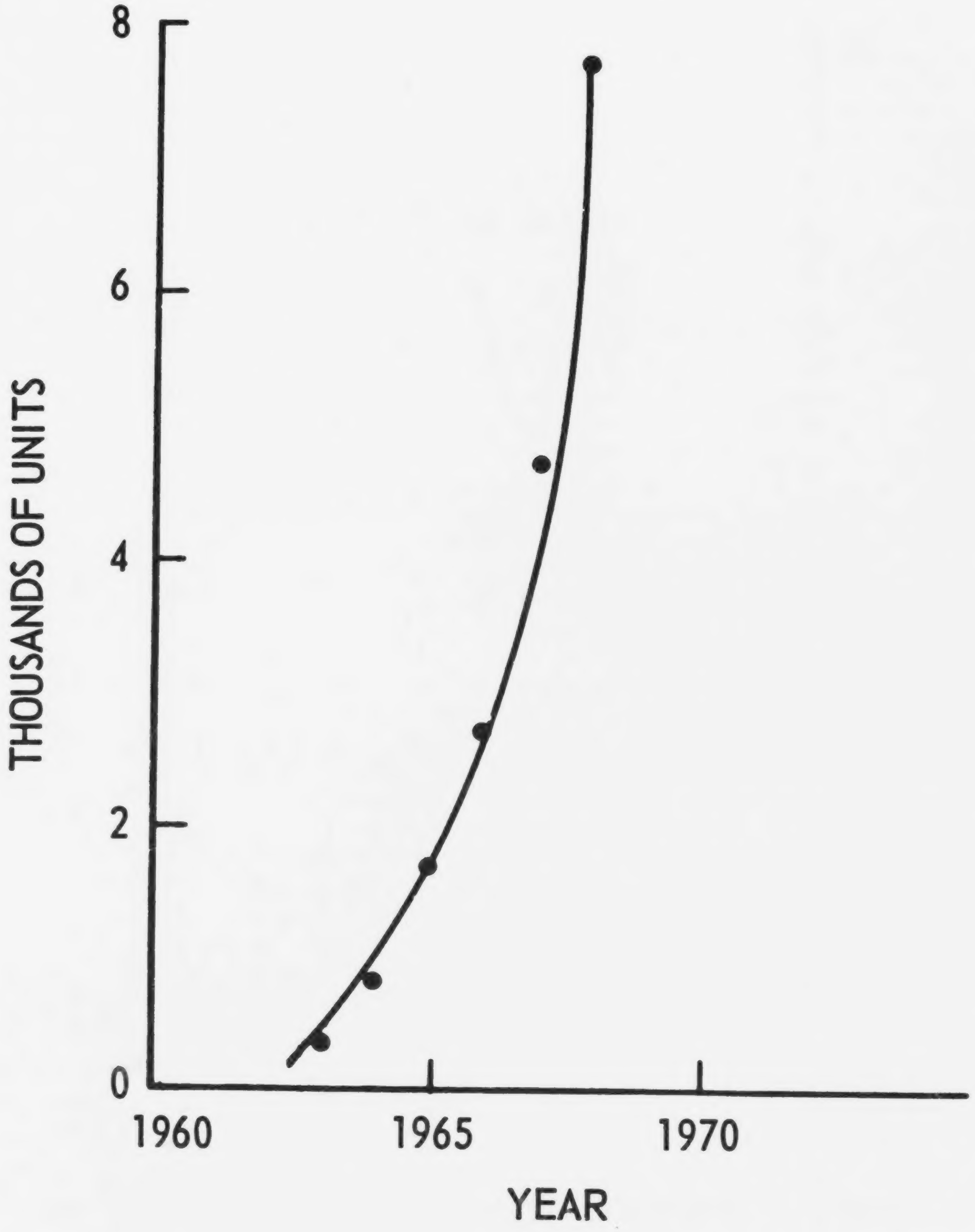

Figure 4. Total U.S. sales of lasers, 1963–1968

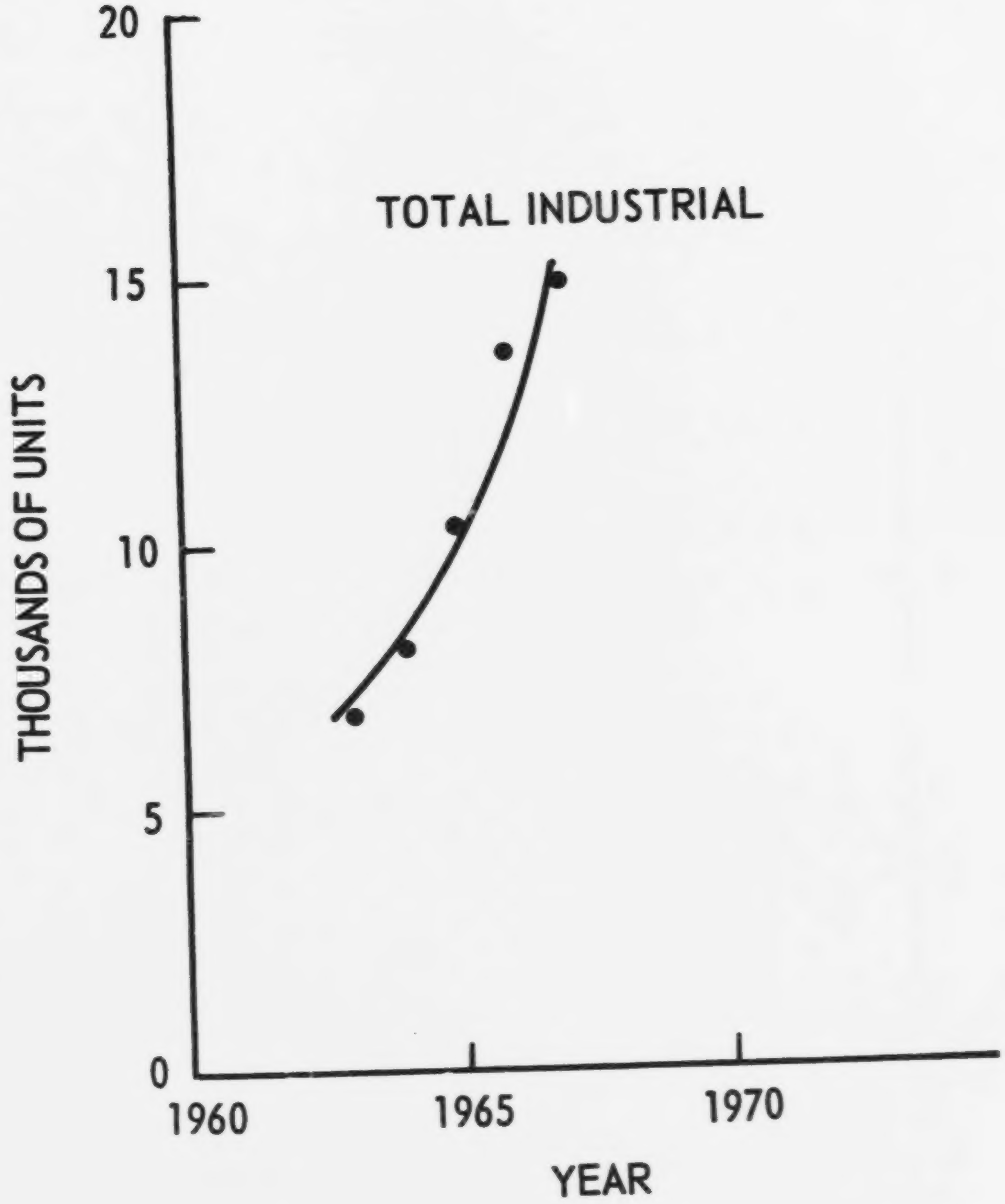

Figure 7. Shipments of industrial ultrasonic equipment 1963–1967[a]

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[a] Information from the Department of Commerce Current Industrial Reports, MA-36N.

Table 20. Typical frequency range for various ultrasonic applications[a]

Application	Average frequency range
Upper limit of human hearing	16 kHz
Ultrasonic metal working and welding	16 - 25 kHz
Ultrasonic cleaning	20 - 40 kHz
Defoaming and degasing	3 - 30 kHz
Control applications	16 - 45 kHz
Nondestructive testing	1 - 10 MHz

[a] Information from "Ultrasonics and Quiet Boom," Dun's Review, September 1968, pages 105-112.

Table 21. Ultrasonic market outlook — 1968-1973 (sales volume — millions of dollars)

Use	1968[a]	1973[a]	Percent change
Cleaning	$18.0	$30	+ 67
Instrumentation	15.0	30	+ 100
Medical ultrasonics	7.0	30	+ 329
Miscellaneous processes	7.0	22	+ 214
Assembly	5.0	20	+ 300
Electronics	5.0	10	+ 100
Consumer products	0.1	10	+9,900
Packaging	0.2	5	+2,400
Textiles	0.1	5	+4,900
TOTAL	$57.4	$162	+ 182

[a] Information from "Ultrasonics and Quiet Boom," Dun's Review, September 1968, pages 105-112.

Although no surveys could be found indicating the actual inventory of various ultrasonic devices, some items are estimated in table 22. The rapidly expanding use of ultrasonic power tends to put some urgency in the need to study levels and biological effects of stray radiation from various ultrasonic devices.

Table 22. Estimates of inventory of ultrasonic devices, 1969

Medical diagnostic ultrasonic units	[a]2,000
Medical therapeutic ultrasonic units	[a]2,000
Ultrasonic cleaners	[b]tens of thousands
Ultrasonic welders	[b]few thousand

[a] D. Hart, 1969, "Survey of Ultrasonics in Medicine," presented at Commercial Applications of Ultrasonics Symposium, February 6, 1969, New York, N.Y.

[b] D. J. Kolb, VP Marketing, Branson Sonic Power Company, Personal Communication, May 1969.

Sonic

Vibrations perceivable by the auditory system (20 – 20,000 Hz) are termed sound in contrast to those vibrations in excess of 20,000 Hz (ultrasound) and those less than 20 Hz (infrasound). Many sources, both electronic and nonelectronic make up the total sound pollution of out environment. Some of these are indicated in table 23.

Table 23. Typical sources of environmental sound contamination

Radios	Trains
Televisions	Aircraft
Phonographs	Industrial Equipment
Power Mowers	Construction Equipment
Power Saws	Air Conditioners
Electronic Music Instruments	Boats
Automobiles	

The tolerable noise level for the human ear is about 90 dB. Surveys indicate that the sound intensity in the average residence was five times greater in 1968 than in 1938 climbing from 30 to 45 dB in 30 years.[36]

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[36] E. Berman and L. Rosenstein, "Sound and Infrasound," BRH, DBE, Unpublished Review.

The FAA has proposed noise certification standards for new aircraft. "The FAA proposal is the first regulatory action taken under the recently enacted Public Law 90-411 which grants the agency broad authority in the noise control area including the authority to withhold certification on aircraft which fail to meet prescribed noise standards."[37] At the present time it appears that aircraft noise limitations are eminent. "The Nixon Administration is on the verge of announcing the first Federal limitation on aircraft noise: no new jet planes will be certified by the Department of Transportation unless they can meet an average PNB (perceived noise decibel) of under 108 and eventually 80. Most jets today bombard areas around airports with 111 to 120 PNB (a busy New York City corner at rush hour is 95 PNB)."[38]

Infrasonic

"When sound pressure level variation (frequency) occurs at a rate less than the minimum detectable frequency (16 cps in a young healthy ear), that portion of the spectrum is termed infrasound."[39] These vibrations can emanate from a variety of sources both natural and man-made such as those in table 24.

Table 24. Some sources of infrasonic vibrations

Earthquakes	Rotating cock siren
Erupting volcanoes	Machinery
Thunder	Air conditioning systems
Wind	Vibration testing equipment
Reciprocations at end of long pipe	

No attempt was made to obtain inventory information on infrasonic producing devices. This vibration is usually unintentional and can be produced by many devices under particular structural circumstances.

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[37] FAA Information, "Noise Certification Standards for New Aircraft Proposed by FAA." Press Release, January 6, 1969.

[38] News Note, "Jet Airliners: New Curbs Ahead," Newsweek, June 30, 1969.

[39] E. Berman and L. Rosenstein, "Sound and Infrasound," BRH, DBE. Unpublished Review.

Magnetic Fields

It has been stated that "any moving electrical charge has an associated field of magnetic force about it; that is equally true for the electrons in the atomic and molecular constituents of all matter including life forms as well as for electrical current in power transmission lines, appliances and industrial equipment."[40] Needless to say, the total inventory of devices capable of producing magnetic fields would be in the billions. On the other hand, however, probably only a few sources produce field strengths with magnitude and accessability to humans to present biological hazards. Such sources as accelerators (previously discussed in ionizing radiation section), plasma physics experiments (total number of units extremely small), and high capacity electric power generating apparatus might fall into this category.

ELECTRONIC COMPONENTS

Although the electronic components are an integral part of the products which may have been inventoried separately (for example, color TV picture tubes and color TV sets), the component production information is generally more readily available and in some cases can give an advance indication of production activity for certain products. For example, magnetron sales should reflect to some degree the future production of microwave heating devices. For these reasons production rate data on specific components capable of emitting harmful radiation have been included in table 25 to supplement the product inventory. Figure 4 shows the total and nondefense shipments of magnetrons for the years 1960 – 1967. Figure 5 shows the same for klystron shipments.

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[40] Harry D. Youmans, Jr., "Biological Aspects of Magnetic Fields," Unpublished Review.

Table 25. Estimated annual shipments of selected electronic components 1960-1967[a]
(quantity in thousands of units)

	1960	1961	1962	1963	1964	1965	1966	1967
POWER AND SPECIAL PURPOSE TUBES	11,063	7,849.2	8,849.2	9,322.0	9,868.7	13,087.7	15,544.6	15,359.0
High vacuum tubes	3,478	3,746.2	4,099.3	4,212.3	3,751.1	3,944.4	4,346.1	4,481.3
Diodes	451	459.1	---	361.3	290.1	276.9	395.0	591.8
External anode, except diodes	1,143	1,374.2	1,141.7	1,541.8	1,414.5	1,456.1	1,775.9	1,857.3
100 watts or less	839	978.8	631.2	1,068.0	1,065.2	1,030.3	1,207.7	1,209.1
Over 100 watts	304	395.4	510.5	473.8	349.3	425.8	568.2	648.2
Internal anode, except diodes	1,884	1,912.9	2,486.0	2,309.2	2,048.8	2,221.4	2,175.2	2,032.2
150 watts or less	---	1,842.1	2,408.8	2,240.2	1,996.7	2,153.1	2,104.9	1,952.7
Over 150 watts	---	70.8	77.2	69.0	52.1	68.3	70.3	79.5
Gas and vapor tubes	2,306	1,757.3	1,918.6	1,618.6	1,382.6	1,648.6	1,520.3	1,509.4
Diodes	643	665.4	581.7	680.3	541.7	661.9	516.0	580.0
Thyratrons and ignitrons	1,441	844.4	1,113.5	762.8	743.3	863.0	846.4	762.8
Gas duplexers (TR, ATR, etc.) spark gaps and noise source tubes	222	247.5	223.4	175.5	97.6	123.7	157.9	166.8
Klystrons	157	182.5	183.1	147.1	143.6	182.8	198.3	197.2
Reflex oscillators	144	173.1	173.8	137.7	136.7	175.1	187.5	187.7
Continuous wave and pulsed	13	9.4	9.3	9.4	6.9	7.7	10.8	9.5
Magnetrons	78	68.5	70.9	65.3	63.2	81.4	99.4	97.8
Continuous wave	---	---	21.9	26.1	17.1	29.3	35.7	26.7
Pulsed, fixed	---	---	17.7	17.3	15.1	17.9	27.9	35.5
Pulsed, tunable	---	---	31.3	21.9	31.0	34.2	35.8	35.7
Forward and backward wave tubes	12	22.4	33.1	28.4	22.4	25.6	31.8	45.6
Forward wave, continuous wave	---	---	18.1	14.7	13.8	14.7	19.2	27.6
10 watts or less	---	11.9	14.9	12.2	11.6	13.1	15.3	21.4
Over 10 watts	---	3.4	3.2	2.5	2.2	1.6	3.9	6.2

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[a] Data from U.S. Department of Commerce, Business and Defense Services Administration, Washington, D.C. 20230, "Consolidated Tabulation, Shipments of Selected Electronic Components for Calendar Years 1960-1967."

Table 25. Estimated annual shipments of selected electronic components 1960-1967[a] (continued)
(quantity in thousands of units)

	1960	1961	1962	1963	1964	1965	1966	1967
Forward wave, pulsed	---	---	4.5	5.4	3.3	3.3	2.5	4.1
Backward wave	4	7.1	10.5	8.3	5.3	7.6	10.1	13.9
Light Sensing tubes	1,054	1,358.3	1,792.0	2,353.5	2,187.0	2,723.8	1,873.2	1,924.4
Light emitting	324	276.9	274.7	217.2	209.6	236.9	330.1	343.1
Single-gun	---	259.5	255.9	202.0	194.6	222.1	---	322.3
Multi-gun	---	17.4	18.8	15.2	15.0	14.8	---	20.8
Storage and special purpose display	6	10.3	17.0	16.4	13.7	13.2	20.8	24.3
Miscellaneous special purpose	3,648	426.8	460.5	663.2	2,095.5	4,221.0	7,124.6	6,735.9
RECEIVING TUBES	398,327	379,214	369,342	331,379	335,826	348,938	367,829	271,071
Minature and sub-minature G & V	298,770	277,647	283,338	265,824	262,292	290,562	313,140	227,531
Standard glass (G and GT) ceramic and other types	99,557	101,567	86,004	65,555	63,534	59,076	54,689	43,540
TELEVISION PICTURE TUBES	13,035	12,178	11,072	11,831	12,654	13,281	15,367	12,849
Black and white	---	---	---	---	---	---	9,653	6,692
Color	---	---	---	---	---	---	5,714	6,157
CAPACITORS, VARIABLE AIR DIELECTRIC	---	15,699	15,516	12,951	11,059	11,620	12,785	7,748
RELAYS, DRY REED	---	---	---	2,700	6,101	9,334	17,467	13,504

[a] Data from U.S. Department of Commerce, Business and Defense Services Administration, Washington, D.C. 20230, "Consolidated Tabulation, Shipments of Selected Electronic Components for Calendar Years 1960-1967."

APPENDIX A

PARTIAL LISTING OF MANUFACTURERS OF ELECTRONIC PRODUCTS AND COMPONENTS

APPENDIX A

PARTIAL LISTING OF MANUFACTURERS OF ELECTRONIC PRODUCTS AND COMPONENTS[a]

Abar Corporation 905 Pennsylvania Blvd., Feasterville, Pa. 19048
Abtronics Incorporated PO Drawer 712, Livermore, Calif.
Accuracy Scientific Instrument Co, Inc 335 E. Chew Ave., Philadelphia, PA. 19120
Ace Glass, Inc PO Box 688, Vineland, N.J. 08360
Ace Scientific 1420 E. Linden Ave., Linden, N.J. 07036
Acoustica Associates, Inc 5331 W. 104th St, Los Angeles, Calif. 90045
Acromag, Inc 30765 Wixom Rd, Wixom, Mich. 48096
Adelphi Surgical Co 41 Lafayette Ave., Brooklyn, NY
Ademco 100 Voice Rd, Carle Place, NY 11514
Adjustable Fixture Co. E. Mason & Front Sts., Milwaukee, Wisc.
Admiral Corp. 3800 W. Cortland St., Chicago, Ill.
Advanced Instrument Newton Highlands, Mass.
Advanced Kinetics, Inc. 1231 Victoria St., Costa Mesa, Calif. 92627
AEI Electronic Apparatus Division 220 E. 23rd St., New York, NY 10025
Aero-Chatillion Corporation A. H. Emery Div., 70 Pine St., New Canaan, Conn. 06841
Aerojet-General Corporation PO Box 216, Aerometrics Div., San Ramon, Calif. 95583
Aerolux Light Company, Inc. 653 Eleventh Ave., New York, NY 10036
Aerometrics Division PO Box 216, San Ramon, California
Aerospace Controls Corporation 215 W. 131st St., Los Angeles, Calif. 90061
AGAC-Derriton, Incorporated 1332 N. Henry St., Alexandria, Va. 22314
Agriculture Specialty Company, Incorporated 11313 Frederick Ave., Beltsville, Md. 20705
Air Shields, Incorporated 4 County Line Rd., Hatbio, Pa.
Airco, Temescal 2850 7th St., Berkeley, Calif. 94710
Aircraft Porous Media Incorporated Glen Cove, New York
Airpax Electronics Incorporated PO Box 8488, Ft. Lauderdale, Fla. 33310
Airsol Instruments 26 Sparta Dr., Short Hills, N.J. 07078
Ajax Magnethermic Corporation 1745 Overland Ave., Warren, Ohio 44482
Ajay Instruments 31 Field St., Glenbrook, Conn. 06906
Akashi Seisakusho (Hardco Scientific) 6811 Grace Ave., Cincinnati, Ohio 45227
Alarmtronics Engineering, Incorporated 154 California St., Newton, Mass.
Alconox Incorporated 217 Park Ave. South, New York City, NY
Alford Manufacturing Company 120 Cross St., Winchester, Mass. 01890
Alfred Electronics 3176 Porter Dr., Palo Alto, Calif. 93404
Allied Chemical Corporation General Chemical Div., PO Box 70, Morristown, N.J. 07960
Allied Electronics Corporation 100 N. Western Ave., Chicago, Ill. 60680
Allis-Chalmers PO Box 512, Milwaukee, Wisc. 53201
A. S. Aloe Company 1831 Olive St., St. Louis, Mo.
Alpine Geophysical Association, Incorporated 65 Oak St., Northwood, N.J. 07648
Alton Electronics Company PO Box 185, Summit, N.J. 07901
Amana Amana, Iowa
American District Telegraph Company 155 6th Ave., New York, NY 10013
American Electronic Labs PO Box 552, Lansdale, Pa. 19446
American Electronics, Incorporated 14851 N.W. 27th Ave., Opa-Locka, Fla. 33054
American Hospital Supply Corporation Scientific Prod. Div, 1210 Leon Pl, Evanston, Ill.
American Instrument Company, Incorporated 8030 Georgia Ave., Silver Spring, Md. 20910
American Manufacturers Corporation 14250 Plymouth Rd., Detroit, Mich.
American Microwave, Incorporated Salt Lake City, Utah

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[a] Additional information available on McBee Keysort Cards.

Manufacturers Continued

American Optical Southbridge, Massachusetts
American Optical Corporation Medical Div., PO Box 361, Bedford, Mass. 01730
American Optical Corporation Scientific Instrument Div., Sugar & eggert Rds, Buffalo, NY
American Science & Engineering, Incorporated 11 Carleton St., Cambridge, Mass. 02142
American Standard Aero Res. Instrument Div, 9000 King St., Franklin Park, Ill. 60131
American Sterilizer Erie, Pa.
American Time Products Division 61-20 Woodside Ave., Woodside, N.J.
American Ultraviolet Company 64 Commerce St., Chatham, N.J. 07828
Amglo Corporation 4333 N. Ravenswood Ave., Chicago, Ill. 60613
Amphenol RF Division Bunker-Ramo Corporation 33 E. Franklin St, Danbury, Conn. 06810
Amsco Industrial Company 2424 W. 23rd St., Erie, Pa. 16512
Amstro Corporation 12 Clinton Rd., Fairfield, N.J. 07006
Amtron, Incorporated 14820 S. Kedzie Ave., Midlothian, Illinois 60445
Anacon, Incorporated 62 Union St., Ashland, Mass. 01721
Andonian Associates, Incorporated 26 Thayer Rd., Waltham, Mass. 01254
Andrea Radio Corporation 27-01 Bridge Plaza, North, Long Island City, N.Y. 11101
Angstrom, Incorporated PO Box 256, Belleville, Michigan 48111
R. B. Annis, Company 1101 N. Delaware St., Indianapolis, Indiana 46202
AO Instrument Company Eggert & Sugar Roads, Buffalo, NY 14215
AO Instrument Company Box 361, Bedford, Mass. 01730
Applied Instruments, Incorporated 25 Will Pl., Brooklyn, NY 11207
Applied Microwave Lab, Incorporated Andover St., Andover, Massachusetts 01810
Applied Radiation Corporation 2404 North Main, Walnut Creek, California 94596
Applied Research Labs PO Box 129, Sunland, California 91040
ARF Products, Incorporated Raton, New Mexico
Arenberg Ultrasonic Lab, Incorporated 94 Green St., Jamaica Plain, Mass. 02130
Argonaut Associates, Incorporated PO Box K, Beaverton, Oregon 97005
Aristo Grid Lamp Products, Incorporated 65 Harbor Rd., Pt. Washington, NY 11050
Arnold Engineering Company PO Box G, Marengo, Ill. 60152
Arvin Industries, Incorporated Consumer Products Div., Columbus, Indiana 47201
Associated Testing Labs, Incorporated 162 Rt. 46, Wayne, N.J. 07470
Astro Industries, Incorporated PO Box 938, Santa Barbara, California 92803
Atkins Technical, Incorporated PO Box 14405, Gainesville, Fla. 32601
Atlantic Research Corporation Shirley Highway at Edsall Rd., Alexandria, Va. 22314
Atlantic Ultraviolet Corporation 24-10 40th Ave., Long Island City, NY 11101
Atlas Engineering Company Twinco Div., 10 Cheney St., Dorchester, Mass. 02121
Atomergic Chemetals Company 584 Mineola Ave., Carle Place, NY 11514
Atomic Energy of Canada, Ltd. PO Box 93, Ottawa, Ontario, Canada
Atomic Products Corporation Atomic Rd., Center Moriches, NY
Austron, Incorporated 10214 N. Interregional Highway, Austin, Texas 78753
Automatic Process 26 Sparta Dr., Short Hills, N.J. 07078
Automation Industries, Incorporated PO Box 245, Phoenixville, Pennsylvania 19460
Automation Products, Incorporated 3030 Max Roy St., Houston, Texas 77008
Autotron, Incorporated 3629 N. Vermillion St., Danville, Ill. 61832
Avco Everett Research Lab 2385 Revere Beach Parkway, Everett, Mass. 02149
Avionics Research Products Corporation 6901 W. Imperial Highway, Los Angeles, Cal. 90044
Aztec Instruments, Incorporated 2 Railroad Pl., Wesport, Conn. 06880
B & K Instruments, Incorporated 5111 W. 164th St., Cleveland, Ohio 44142
Bacharach Instruments 625 Alpha Dr., RIDC Industrial Park, Pittsburgh, Pa. 15238
Badger Meter Manufacturers Company 4545 Brown Deer Rd., Milwaukee, Wisc. 53223
Bailey Meter 29801 Euclid Ave., Wickliffer, Ohio 44092
Baird-Atomic Incorporated 33 University Rd., Cambridge, Mass. 02138
J. T. Baker Chemical Company Phillipsburgh, N.J. 08865
Balder Cryogenic 26 Sparta Dr., Short Hills, N.J. 07078

Manufacturers Continued

Ballantine Laboratories Incorporated Boonton, N.J. 07005
Ballistics Control Corporation 3950 Crescent St., Long Island City, N.Y. 11101
Balzers AG, Sold by Hardco Scientific 6811 Grace Ave., Cincinnati, Ohio 45227
Barber-Colman Company Industrial Instruments Div., 1300 Rock St., Rockford, Ill. 61101
Barnes Engineering Company 44 Commerce Rd., Stamford, Conn. 06902 Def. & Space Div.
Barnstead Still & Sterilizer Company 225 Rivermoor St., West Roxbury, Boston, Mass.02132
Barton-Blakeslee Incorporated 1622 S. Laramie Ave., Chicago, Ill.
Baruch Instruments Corporation 203 N. Highland Ave., Ossining, NY 10562
Bausch & Lomb Incorporated 77468 Bausch St., Richester, N.Y. 14602
Beck-Lee Medical Electronics 626 Jackson Blvd., Chicago, Illinois 60606
Beckman Instruments Incorporated 2500 Harbor Blvd., Fullerton, Calif. 92634
Beckman Instruments Incorporated Cedar Grove Operation, 89 Commerce Rd, Cedar Gr., N.J.
Beckman Instruments Incorporated Electronic Instrumnts. Div, 2200 Wright Ave, Richmnd,Ca.
Beckman Instruments Incorporated Spinco Division, 117 Calif. Ave, Palo Alto, Cal. 94304
Beckman & Whitley Incorporated 441 Whisman Rd., Mountain View, Calif. 94040
Bel-Art Products Pequannock, N.J. 07440
Bell & Howell Electronic Instrumentation Group, 360 Sierra Madre Villa, Pasadena, Cal.
Bellco Glass Incorporated Edrudo Rd., Vineland, N.J. 08360
Bendix Corporation, Instruments & Life 2734 Hickory Grove Rd, Davenport, Iowa 52808
Bendix Corporation Scientific Instruments Div., 3625 Houck Rd., Cincinnati, Ohio 45241
Bendix Corporation Pacific Div., 8211 Landershim Blvd., N. Hollywood, Calif. 91605
Benthos Incorporated Edgerton Dr., N. Falmouth, Mass. 92556
J. & H. Berge, Incorporated 4111 S. Clinton Ave., S. Plainfield, N.J. 07080
Berkshire Labs 101 Tansy Rd., Milford, N.Y. 13807
Bessett-Berman Corporation Marine Div., G St. Pier, San Diego, Calif. 92101
Best Scientific Glass Company 4527 N. Pulaski Rd., Chicago, Ill. 60630
Bethelem Apparatus Company Incorporated Front & Depot Sts., Hellertown, Pa. 18055
Bethesda Instrument Labs 4925 Fairmont Ave., Bethesda, Md. 20014
Bico 3116 Valhalla Dr., Burbank, Calif. 91504
James G. Biddle Company Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
B I F Div. of NY Air Brake Company 345 Harris Ave., Providence, R. I. 02909
Biocom Incorporated 5883 Blackwelder St., Culver City, Calif. 90239
Bioelectric Instruments, Incorporated PO Box 204, Hasting-On-Hudson, N.Y. 10706
Bio-Medical Electronics Incorporated 653 Lofstrand Lane, Rockville, Md. 20850
Bio-Rad Labs 32nd & Griffin Ave., Richmond, Calif. 94804
Birtcher Corporation 4371 Valley Blvd., Los Amgeles, California
Bitter Built Machinery Corporation 441 Market St., Saddlebrook, N.J. 07662
Bitronex Lab, Incorporated 9153 Brookville Rd., Silver Spring, Md. 20910
Black Dentaprises 3100 NW 77th Ct., Miami, Fla. 33144
Black Light Eastern Corporation 29 N. Y. Ave., Westbury, N.Y. 11590
Black Light Products 1507 W. Laurence Ave., Chicago, Ill. 60640
Blackstone Ultrasonics Incorporated PO Box 488, Sheffield, Pa. 16431
S. Blickman Incorporated 526 Gregory Ave., Weehawken, N.J.
Block Engineering Incorporated 19 Blackstone St., Cambridge , Mass. 02139
Blue M Electric Company 138th & Chatham St., Blue Island, Ill. 60406
William Boekel & Company Incorporated 509-519 Vine St., Philadelphia, Pa. 19106
Bogue Electric Manufacturing Company 61 Kentucky Ave., Paterson, N.J.
Bond Optics Division Bond Research Labs Etna Rd., Lebanon, N. H. 03766
Boyer-Winona Corporation Winona Lake, Md.
Braincon Corporation 13 Shenandoah Rd., Marion, Mass. 02738
Branson Instruments Company 76 Progress Drive, Stamford, Conn. 06904
Branson Sonic Power Miry Brook Rd., Danbury, Conn. 06810
Richard D. Brew & Company, Incorporated 90 Airport Rd., Concord, N. H. 03301

Manufacturers Continued

Brinkmann Instruments Cantiague Rd., Westbury, N. Y. 11590
Briscoe Manufacturing Company 1055 Gibbard Ave., PO Box 628, Columbus, Ohio 43216
Bristol Company PO Box 1790, Waterbury Conn. 06720
Bronson Equipment Company 63 Terminal Ave., Clark, N.J.
Brookline Instrument Company 33 Virginia Rd., White Plains, N.Y. 10603
Broomer Research Corporation 23 Sheer Pl., Plainview, N.Y. 11083
Browne-Morse Company Muskegon, Mich. 49443
Bruker Scientific Incorporated 1 Westchester Plaza, Elmsford, N.Y. 10523
Brulin & Company Incorporated 2920 Martindale Ave., Indianapolis, Indiana
BTU Engineering Corporation Bear Hill Rd., Waltham, Mass. 02154
Buchler Instruments Incorporated 1327 16th St., Fort Lee, N.J. 07024
Budd Company Instrument Division PO Box 245, Phoenixville, Pa.
Buehler Limited 2120 Greenwood St., Evanston, Ill. 60204
John Bunn Corporation 1103 S.Walden Ave., Alden, N.Y.
Burdick Corporation Milton, Massachusetts, Milton, Wisconsin
Burr-Brown Research Corporation PO Box 11400, Tucson, Arizona 85706
Burrell Corporation 2223 Fifth Ave., Pittsburgh, Pa. 15219
Bush, G.F., Associates PO Box 175, Princeton, N. J. 08540
C-Cor Electronics Incorporated 60 Decibel Rd., State College, Pa. 16801
Cahn Instrument Company Div. of Amer. Bosch Arma Corp., 7500 Jefferson St, Paramount,Cal
Calbio Research 12 Unami Lane, Scotch Plains, N.J. 07076
Calbiochem 3625 Medford St., Los Angeles, Calif. 90063
California Instruments Corporation 3511 Midway Dr., San Diego, California 92110
California Lab Equipment 1165 67th St., Oakland, Calif. 94608
California Optical Research PO Box 2245, La Jolla, Calif. 92037
Camag Incorporated 11830 W. Ripley Ave., Milwaukee, Wisconsin 53226
Cambosco Scientific Company Incorporated 342 Western Ave., Boston, Mass. 02135
Cambridge Instruments Company Incorporated 73 Spring St., Ossining, N.Y. 10562
Cambridge Thermionic Corporation 445 Concord Ave., Cambridge, Mass. 02138
Cameron-Miller Surgical Instruments Company 329 Wood St., South, Chicago, Ill.
Canal Industrial Corporation 5635 Fisher Lane, Rockville, Md., 20852
Canberra Data Systems PO Box 1088, Middletown, Conn. 06457
Canberra Industries 50 Silver St., Middletown, Conn. 06457
Canoga Electronics Corporation 8966 Comanche Ave., Chatsworth, Calif. 91311
Canrad Precision Industries, Incorporated 630 Fifth Ave., New York, NY 10020
Cardiac Electronic Incorporated 4015 Ransom Rd., Clarence, NY 14031
Cardinal Products Incorporated E. ,arkham Ave., PO Box 1611, Durham, N. C. 27702
R. P. Cargille Laboratories Incorporated 55 Commerce Road, Cedar Grove, N. J. 07009
Carle Instruments Incorporated 1141 E. Ash Ave., Fullerton, Calif. 92631
Carnegie-Mellon University API Samples, Schenley Park, Pittsburgh, Pa. 15213
Carver Corporation 711 Stierlin Rd., Mountain View, Calif.
Fred S. Carver Incorporated 54 River Rd., Summit, N. J. 07901
Cary Instruments 2724 S. Peck Rd., Monrovia, Calif. 91016
Casco Products 512 Hancock Ave., Bridgeport, Conn.
The Casey Phillip Manufacturing Company Wayne Ave. at Cooper St., Cincinnati, Ohio
Castle Company 1777 E. Henrietta Rd., Rochester, N.Y. 14623
Burton Division Cavitron Corporation, 7922 Haskell Ave., Van Nuys, Calif. 91406
Cavitron Ultrasonics 11-42 Borden Ave., Long Island City, N.Y.
Cenco Instruments 1800 Foster Ave., Chicago, Ill. 60640
Centorr Associates Incorporated PO Box 175, Suncook, N. H. 03275
Central Scientific Company 2600 S. Kostner Ave., Chicago, Ill. 60623
Chadwick-Helmuth Company Incorporated 111 E. Railroad Ave., Monrovia, Calif. 91016
Chambers Corporation Oxford, Mississippi
Champion Lamp Works Division 330 Lynnway St., Lynn, Mass.
Chance-Pilkington Optical 5420 Wlaker Ave., Rockford, Ill. 61111

Manufacturers Continued

Channel Industries Incorporated 839 Ward Dr., Santa Barbara, Calif. 93105
Charles Scientific 295 Central Park West New York, NY 10024
Charlestown Rubber Company Stark Industrial Park, Charlestown, S. C. 29401
Chatas Glass Company 570 Broadlawn Terrace, Vineland, N. J. 08360
Chatham Manufacturing Company Elkin, N. C.
The Chemical Rubber Company 18901 Cranwood Parkway Cleveland, Ohio 44138
Chemplast Incorporated 150 Dey Rd., Wayne, N. J. 07470
Chesapeake Instrument Corporation 100 Atwell Rd., Shadyside, Md. 20867
The Chicago Faucet Company 2100 S. Nuclear Dr., Des Plaines, Ill. 60018
Christie Electric Corporation 3410 W. 67th St., Los Angeles, Calif. 90043
Cincinnati Cleaning and Finishing Machy Company 2000 Hageman, Cincinnati, Ohio
Clairtone Electric Corporation 100 Ronson Dr., Rexdale, Ontario, Canada
Clairtone Electric Corporation 681 5th Ave., New York, NY 10022
Clay-Adams Incorporated 141 E. 25th St., New York, NY 10010
Clevite Corporation Ordance Division 18901 Euclid Ave., Cleveland Ohio 44117
CM^2 Incorporated 193 Constitution Dr., Menlo Park, Calif. 94025
Colabo Labs Incorporated 1526 Halsted St., Chicago Heights, Ill. 60411
Cole-Palmer Instrument Company 7441 N. Oak Park Ave., Chicago, Illinois 60648
Coleman Instruments 42 Madison St., Maywood, Ill. 60153
Computer Instruments Corporation 92 Madison Ave., Hempstead, NY 11550
Concept Incorporated 6003 126th Ave., N., Clearwater, Fla.
Concord Control Incorporated 1282 Soldiers Field Rd., Boston, Mass. 02135
Conductron Corporation 3475 Plymouth Rd., Ann Arbor, Mich. 48107
Congenel Incorporated 50 Rockefeller Plaza, New York, NY 10020
Conoflow Corporation PO Box 245, Blackwood, N. J. 08012
Conrac Corporation 330 Madison Ave., New York, NY 10017
Conrad-Missimers 3737 San Fernando Rd., Glendale California 91204
Consolidated Controls Corporation 15 Durant Ave., Bethel, Conn. 06801
Continental Hospital Industries 18636 Detroit St., Cleveland, Ohio
Continental Instrument Corporation 110 Atlantic Ave., Lynbrook, N. Y. 11563
Continental Telephone Supply 17 W. 46th St., New York, NY
Control Data Corporation 535 Broad Hollow Rd., Melville, NY 11746 Melville Sp. & Def.Sys
Control Equipment Corporation 32 Kearney Rd., Needham Heights, Mass. 02194
Controls Company of America 2001 N. Janice Ave., Melrose Park, Ill. 60160
Coors Porcelain Company 600 Ninth St., Golden, Colorado 80401
Copes-Vulcan Div. of Blaw-Knox Co. 939 W. 26th St., Erie, Pa. 16512
Corion Instrument Corporation 23 Fox Rd., Waltham, Mass. 02154
Corning Glass Works Technical Products Div., Corning, N.Y. 14830
Cosmic Radiation Labs, Incorporated 1645 Montauk Highway, Bellport, NY 11713
Cosmos Scientific Company 1420 E. Linden Ave., Linden, N. J. 07036
Crest Ultrasonics Corporation Mercer County Airport, Trenton, N. J. 08268
Cryodry San Ramon, Calif.
Cryogenics Engineering Company 4955 Bannock St., Denver, Colo. 80216
Cryogenic Research Company PO Box 881, Boulder, Colorado 80302
Crystal Optics Research Incorporated 1360 N. Main St., Ann Arbor, Mich. 48104
W. H. Curtin & Company PO Box 1546, Houston, Texas 77001
Curtis Mathes Manufacturing Company Incorporated 2220 Young St., Dallas, Texas
Custom Scientific Instruments, Incorporated 43 Wing Dr., Whippany, N.J. 07981
Cyclotron Corporation 950 Gilman St., Berkeley, Calif. 94710
Dadco 2018 Hillside Ave., New Hyde Park, NY
A. Daigger & Company 159 W. Kinzie St., Chicago, Ill. 60610
Dallons Laboratories Division 120 Kansas, El Segundo, Calif.
Dana Labs, Incorporated 2401 Campus Dr., Irvine, Calif. 92664

Manufacturers Continued

Darcy Industries, Incorporated 1723 Clovefield Boulevard, Santa Monica, Calif. 90404
Data Device Corporation 240 Old Country Rd., Hicksville, N.Y. 11801
Datascope Bronx, N. Y. 1831 Grand Concourse   10453
Datascope Corporation 520 Victor Street, Saddle Brook, N. J. 07662
David Kopf Instruments PO Box 636, Tujunga, Calif. 91042
Dean Products Incorporated 985 Dean St., Brooklyn, N.Y. 11238
Deco Research & Development Park Ave., Huntington, N. Y. 11743
Dell Optics Company Incorporated 9226 Kennedy Blvd. North Bergen, N. J. 07047
Delmonico International Corporation 30-35 56th Rd., Maspeth, N. Y.
Delta Scientific Corporation 120 E. Hoffman Ave., Lindenhurst, N. Y. 11757
Demornay-Bonardi 1313 N. Lincoln Ave., Pasadena, Calif. 91103
The Dentist's Supply Company of New York 500 College Ave., York, Pa.
Denton Vacuum, Incorporated Cherry Hill, Industrial Center, Cherry Hill, N. J. 08034
Dero Research & Development Corporation Park Avenue, Huntington, N. Y. 11763
Despatch Oven 619 SE 8th St., Minneapolis, Minn. 55414
Detnex Chemical Industries Incorporated Box 501, Detroit, Mich.
Diapulse Corporation of America Lake Success, N. Y.
Difco Laboratories 920 Henry St., Detroit, Mich. 48201
Diffraction Products, Incorporated 344 Lathrop Ave., River Forest, Ill. 60350
Digital Equipment Corporation 146 Main Street, Maynard, Mass. 01754
J. J. Dill Company 1407 Ravine Rd., Kalamazoo, Mich. 49007
Disa Elektronic Sold by London Co. 811 Sharon Dr., Westlake, Ohio 44145
Dodge F.W. Dwyer Manufacturing Company PO Box 373, Michigan City, Indiana   46360
Dohrmann Instruments Company 1062 Linda Vista Ave., Moutain View, Calif. 94040
Dolan-Jenner Industries, Incorporated 200 Ingulls Ct., Melrose, Mass. 02176
Dranetz Incorporated Plainfield, N. J.
Dubois Chemicals of WR Grace and Company 630 Broadway, Cincinnati, Ohio
Dodge Cork Company, Incorporated Laurel & Manor Sts., Lancaster, Pa. 17604
Dunn Associates, Incorporated PO Box 2047, Silver Springs, Md. 20942
E. I. DuPont DE Nemours & Company, Incorporated 330 E. 30th St., Wilmington, Del. 19898
Duralab Equipment Corporation 303 Stanley Ave., Brooklyn, N. Y. 11207
Durant Manufacturing Company 622 N. Cass St., Milwaukee, Wisconsin 53201
Durham Instrument Corporation 3950 Fabian Way, Palo Alto, Calif. 94303
The Duriron Company, Incorporated PO Box 1019, Dayton, Ohio 45401
Dynamics Corporation of America Massa Div., 280 Lincoln St., Hingham, Mass. 02043
Dynasil Corporation of America Cooper Rd., Berlin, N. J. 08009
Dynasonics Corporation PO Box 672, Pipestone, Minnesota 56164
Dynatronics PO Box 2566, Orlando, Fla. 38202
E - C Apparatus Corporation 755 Saint Marks St., Philadelphia, Pa. 19104
E G & G Incorporated 160 Brookline Ave., Boston, Mass. 02215
E G & G Incorporated Custom Equipment Div., Crosby Dr., Bedford, Mass. 01730
E-H Research Labs, Incorporated PO Box 1289, Oakland, California 94604
E & M Instrument Box 12511A, Houston, Texas 77017
Eagle-Picher Industries, Incorporated American Building, Cincinnati, Ohio 45202
Eagle Range & Manufacturing Company Belleville, Ill.
Ealing Corporation 2233A Mass. Ave., Cambridge, Mass. 02140
Eastern Black Light Corporation 24-A Kinkel St., Westbury, N.Y.
Eastern Scientific Company 267 Plain St., Prividence, R. I. 02905
Eastern Scientific Instruments Corporation 236 Wood Rd., Braintree, Mass. 02184
Eastman Kodak Company 343 State St., Rochester, N. Y. 14650
Eaton-Dikeman Company Filtertown, Mount Holly Springs, Pa. 17065
Eberbach Corporation 505 S. Maple Rd. PO Box 1024, Ann Arbor, Mich. 48106
Edmund Scientific Company 380 Edscope Bldg., Barrington, N.J. 08007

Manufacturers Continued

Ednalite Corporation 200 N. Water St., Peekskill, NY 10566 OCVI Instrum. Div.
Edo Western Corporation 2645 S. 2nd West, Salt Lake City, Utah 84115
Electric Heat Control Apparatus, Inc. 247 N.J.R.R. Ave., Newark, NJ 07105
Electric-Shield Corporation 1605 W. 51st St., Chicago, Ill. 60609
Electro-Guard PO Box 633, Hazelton, Pa. 18201
Electro-Mechanics Company PO Box 1546, Austin, Texas 78767
Electro-Medical Labs PO Box 63, Windsor, Vermont 05089
Electro-Neutronics 630-20th St., Oakland, Calif. 94612 ICN Instrument Division
Electro-Nuclear Labs 115 Indipendence Dr., Menlo Park, Calif. 94025
Electro Optical Associates 974 Commercial St., Palo Alto, Calif. 94303
Electro Optical Industries, Inc. PO Box 3770, Santa Barbara, Calif. 93105
Electro Optics Associates 981-83 Commercial, Mountain View, Calif.
Electro Powerpacs Shadley St., Cambridge, Mass. 02140 Hydra Power Corp.
Electro Powerpacs Corporation 253 Norfolk, Cambridge, Mass.
Electro Scientific Industries, Inc. 13900 N.W. Science Park Dr., Portland, Ore. 97229
Electro-Technic Products 4642 N. Ravenswood Ave., Chicago, Ill. 60640
Electron Beam Corporation 161 Pleasant St., Lynn, Mass 01901
Electron Beam Techniques, Inc. Johnson Ave., Plainville, Conn.
Electronic Acoustic Research Corp. 22 Rincon Vista Rd., Santa Barbara, Calif. 93103
Electronic Assistance Corporation Red Bank, N.J.
Electronic Associates, Inc. 185 Monmouth Parkway, W. Long Beach, N.J. 07764
Electronic Design Labs, Inc. PO Box 7837, Philadelphia, Pa. 19101
Electronic Development New York, New York
Electronics For Life Science, Inc. PO Box 697, Rockville, Md. 20851
Electronics For Medicine, Inc. 30 Virginia Rd., White Plains, N.Y. 10603
Electronics & Alloys, Inc. 145 S. Dean St., Englewood, N.J. 07631
Elektron Standard Rte. 5 S., Windsor, Conn.
Elema-Schonander PO Box 130, Mt. Prospect, Ill. 60056
J. H. Emerson Company 22 Cottage Park Ave., Cambridge, Mass.
Emerson & Cuming, Incorporated 869 Washington St., Canton, Mass. 02021
Brooks Instrument Div., Emerson Electric Company 407 W. Vine St., Hatfield, Pa. 19440
A. H. Emery Company 70 Pine St., New Canaan, Conn. 06841 Sub. of Aer-Chatillion Corp.
Endevco Corporation 801 S. Arroyo PKWY., Pasadena, Calif. 91109
Energy Systems, Incorporated 3180 Hanover St., Palo Alto, Calif. 94304
Engis Equipment Company 8035 Austin Ave., Morton Grove, Ill. 60053
Englehard Hanovia, Incorporated 100 Chestnut St., Newark, N.J. 07105
Englehard Industries, Incorporated 113 Astor St., Newark, N.J. 07114
English Electric Valve 220 E. 23rd St., New York, NY 10010 Sold by Calvert Electronics
Enraf-Nonius, Incorporated 130 Country Courthouse Rd., Garden City Park, NY 11040
Ensco, Incorporated 3100 Eldredge St., Salt Lake City, Utah 84115
Eon Corporation 175 Pearl St., Brooklyn, NY 11201
Eppley Lab, Incorporated 12 Sheffield Ave., Newport, R. I. 02840
Ercona Corporation 432 Park Ave., S., New York, NY 10016 Scientific Instrument Div.
Erie Scientific Corporation 693 Seneca St., Buffalo, NY 14210
Eriez Magnetics 423 Magnet Dr., Erie, Pa. 16512
Esco Products Oak Ridge Rd., Oak Ridge, N.J. 07438
Esterline Angus Instruments Company PO Box 24000, Indianapolis, Indiana 46224
Euphonics 202 Park St., Miami Springs, Florida
Ever Ready ThermometerCompany 116 Wooster St., New York, NY 10012
Executone, Incorporated 47-37 Austell Pl., Long Island City, NY 11101
Fairchild Controls 225 Park Ave., Hicksville, NY 11802
Fairchild Camera & Instrument Corporation 974 E. Arques Ave., Sunnyvale, Calif. 94086

Manufacturers Continued

Farrand Optical Company 535 S. 5th Ave., Mt. Vernon, NY 10550 Comm. Prod. Div.
Federal Research & Development Corporation 620 W. Alosta Ave., Glendora, Cal. 91740
Fermentation Design, Incorporated 726 N. Graham St., Allentown, Pa. 18103
Ferranti Electric, Incorporated Bethpage Rd., Plainview, NY 11803
Ferson Optics, Incorporated 2006 Government St., Ocean Springs, Mississippi 39564
Field Emission Corporation PO Box 58, McMinnville, Oregon 97128
Fieldcrest Mills, Incorporated 60 W. 40th St., New York, NY
Fisher Governor Company 205 S. Center St., Marshalltown, Iowa 50158
Fish-Schurman Corporation 70 Portman Rd., New Rochelle, NY 10802
Fisher Scientific Company Jarrell-Ash Div., 711 Forbes Ave., Pittsburgh, Pa. 15219
Fisher & Porter 295 Warminster Rd., Warminster, Pa. 18974
Flexi-Optics Labs 117 Dover St., Somerville, Mass. 02144
Flow Corporation 127 Collidge Hill Rd., Watertown, Mass. 02172
Forma Scientific, Incorporated PO Box 469, Marietta, Ohio 45650
Forney Engineering Company 6434 Maple Ave., PO Box 35327, Dallas, Texas 75235
Fostoria-Fannon, Incorporated 1985 N. Main St., Fostoria, Ohio
The Foxboro Company Neponset Ave., Foxboro, Mass. 02035
J. Melvin Freed, Incorporated Perkasie, Pa. 18944
Freed Transformer Company, Incorporated 1736 Weirfield Ave., Brooklyn, NY
Adolf Frese Corporation 1430 Grande Vista Ave., Los Angeles, Calif. 90023
Frigidaire Division Department 2361, Dayton, Ohio
Fulton Industries, Incorporated 200 Durham Ave., Metuchen, N.J.
Gaertner Scientific Corporation 1263A Wrightwood Ave., Chicago, Ill. 60614
Galileo Corporation of America 18 E. 53rd St., New York, NY 10022
Gardner Laboratory, Incorporated 5521 Landy Lane, Bethesda, Md. 20014
Gas Atmospheres, Incorporated 5353 W. 161st St., Cleveland, Ohio 44142
GCA Burlington Rd., Bedford, Mass. 01730
George W. Gates & Company, Incorporated PO Box 216, Franklin Square, NY 11010
GE Company X-ray Department 4855 W. Electric Ave., Milwaukee, Wisconsin 53201
Genarco, Incorporated 15-58 127th St., Flushing, NY 11356
General Communication Company Boston, Massachusetts
General Devices, Incorporated PO Box 253, Princeton, N.J. 08540
General Electric Company Appliance Division Appliance Park, Louisville, Ky
General Electric Company 4855 Electric Ave., Milwaukee, Wisconsin
General Electric Lamp Division Nela Park, Cleveland, Ohio
General Instrument Corporation Ultrasonic Division Woodbury, Connecticut
General Precision Systems, Incorporated 6511 Oakton St., Morton Grove, Ill. 60053
General Radio Company 22 Baker Ave., W. Concord, Mass. 01781
General Scientific Equipment Company PO Box 3038, Philadelphia, Pa. 19150
Genisco Technology Corporation 18435 Susana Rd., Compton, Cal. 90221 Data Div
Gentec Hospital Supply Company 250 N. Water St., Milwaukee, Wisconsin 53201
Geodyne Corporation 151 Bear Hill Rd., Waltham, Mass. 02154
Geophysical Instrument & Supply Company 900 Broadway, Denver, Colorado 80203
Georgia Marble Company Alberene Stone Div., 51 Madison Ave., New York, NY 10110
Geoscience Instruments Corporation 435 E. 3rd St., Mt. Vernon, NY 10553
Geo Space Corporation 5803 Glenmont Dr., Houston, Texas 77036
Ralph Gerbrandes Company, Incorporated 8 Beck Rd., Arlington, Mass. 02174
Germfree Labs, Incorporated Manufacturing Div., 2600 SW 28th Lane, Miami, Fla 33133
Giannini-Irvine Applied Physics Lab 205 E. Paularino Rd., Costa Mesa, Calif 92626
Gilford Instrument Labs, Incorporated 132 Artina St., Oberlin, Ohio 44074
Glas Col Apparatus Company 711 Hulman St , Terre Haute, Indiana 47802
Glenwood Range Company Taunton, Mass.

Manufacturers Continued

GM Manufacturers & Instrument Corporation 2417 3rd Ave., Bronx, NY 10451
Goetze-Niemer Company 1701 Brooklyn Ave., Kansas City, Mo. 64141
Claud S. Gordon Company 5710 Kenosha St., Richmond, Ill. 60071
Grason-Stadler Company 15 W. Concord, Mass. 01781
Grass Instrument Company 101 Old Colony Ave., Quincy, Mass. 02169
Greenberg Electric Company 585 Commercial Ave., Garden City, NY 11530
Greiner Scientific Corporation 20-26 N. Moore St., New York, NY 10013
Grieve Corporation 1350 N. Elston Ave., Chicago, Ill. 60622
Grimes Manufacturing Company 600 N. Russell, Urbana, Ohio
Gross Instrument Company 101 Old Colony Ave., Quincy, Mass. 02169
GTS, Incorporated PO Box 1221, Steamboat Springs, Colorado 80477
Gulton Industries Metuchen, N.J. 08840
W. & L. E. Gurley 514 Fulton St., Troy, N.Y. 12181
H-B Instrument Company American & Bristol Sts., Philadelphia, Pa. 19140
h nu Systems Menlo Park, Calif.
HRB-Singer, Incorporated PO Box 60, State College, Pa. 16801
William J. hacker & Company, Incorporated PO Box 646, W. Caldwell, N.J. 07006
Hagan Controls Corporation Div. of Westinghouse PO Box 11606, Pittsburgh, Pa. 15228
Halikainen Instruments 750 National Ct., Richmond, Calif.
Hamilton Manufacturing Company 1316 18th St., Two Rivers, Wisconsin 54241
Hamilton Standard Div. of United Aircraft Corp., Windsor Loacks, Conn. 06096
Harrison & Harrison Optical Engineers 6363 Santa Monica Blvd., Hollywood, Cal. 90038
Harshaw Chemical Company 1945 E. 97th St., Cleveland, Ohio 44106
Hartman-Leddon Company, Incorporated 60th & Woodland Ave., Philadelphia. Pa. 19143
Harvard Apparatus Company 150 Dover Rd., Millis, Mass. 02054
C. A. Hauser & Son Township Line Rd. at Blue Bell Rd., Blue Bell, Pa. 19422
C. I. Hayes 873 Willington Ave., Cranston, R. I. 02910
The Hays Corporation Michigan City, Indiana 46360
Heathkit Benton Harbor, Michigan 49002
Heaton Company Benton Harbor, Michigna 49002
Heat Systems-Ultrasonic, Incorporated 53 E. Mall, Plainview, N.J. 11803
Heat Technology Lab Incorporated 4308 Governors Dr., Huntsville, Alabama
Heath Company Hilltop Rd., Benton Harbor, Mich. 49022
Heidolph-Electro KG 2102 Dempster St., Evanston, Ill. 60201 Sold by Polyscience Corp.
Heinicke Instrument Company 3000 Taft St., Hollywood, Fla. 33020
Heller Laboratories 6600 Hembree Lane, Santa Rosa, Calif. 95401
Hellige, Incorporated 877 Stewart Ave., Garden City, NY 11530
Helma Cells, Incorporated PO Box 544, Borough Hall Station, Jamaica, NY 11424
Hewlett-Packard Company 1501 Page Mill Rd., Palo Alto, Calif. 94304
Hewlett-Packard Avondale Division, Rte. 41, Avondale, Pa. 19311
Hewlett-Packard 175 Wyman St., Waltham, Mass. 02154
Hickok Electrical Instrument Company 10514 Dupont Ave., Cleveland, Ohio 44108
High Voltage Engineering Corporation S. Bedford St., Burlington, Mass. 01803
Highway Trailer Industries Incorporated Edgerton, Wisconsin
James Hinton 358 Chicago Ave., Valparaiso, Fla. 32580
Hi-Shear Corporation 2600 Skypark Dr., Torrance, Calif. 90509
Hitachi Sales Corporation 48-30 39th St., Long Island City, NY
Hoffman Electronics Corporation Hoffman Electronic Park El Monte, Claifornia 91734
Hoffman Products Corporation 571 W. Jackson Blvd., Chicago, Ill. 60606
Hoffrel Instruments, Incorporated Moody's Lane, Norwalk, Connecticut 06851
Holaday Industries, Incorporated 1001 2nd St., South, Hopkins, Minn. 55343
Honeywell Incorporated 4800 E. Dry Creek Rd., Denver, Colo. 80217 Test Instru. Div.

Manufacturers Continued

Honeywell, Inc. Apparatus Controls Div., 2701 4th Ave. S., Minneapolis, Minn. 55408
Honeywell, Inc. Marine Systems Center 5303 Shilshole Ave., Seattle, Wash. 98107
Hospital Equipment Corporation 14 Prospect Pl., East Orange, N.J.
Hospital Supply Company 50-25 38th St., Long Island City, N.Y.
Hotpack Corporation 5086 Coltman Ave., Philadelphia, Pa. 19135
Hotpoint General Electric Co., Appliance Park, Louisville, Kentucky 40225
Howe & French, Incorporated 99 Broad St., Boston, Mass. 02110
Hughes Aircraft Company Centinela & Teale Sts., Culver City, Calif. 90230
Humboldt Manufacturing Company 7300 W. Agatite Ave., Norridge, Chicago, Ill. 60656
Humphrey Electronics, Incorporated 5815 Hillsborough St., Raleigh, N.C. 27606
K. H. Huppert Company 16850 S. State St., S. Holland, Ill. 60473
Hydor Therme Corporation 7166 Airport Highway, Pennsauken, N.J. 08109
Hydro Products Division Dillingham Corporation 11803 Sorrento Valley Rd, San Diego,Ca.
Hygrodynamics, Incorporated 949 Selim Rd., Silver Spring, Md. 20910
ILC, Incorporated 164 Commercial St., Sunnyvale, C lif. 94086
Illumination Industries, Incorporated 610 Vaqueros Ave., Sunnyvale, Calif. 94086
Incor 29 Newton Rd., Plainview, N.Y. 11803
Industrial Dynamics Div. of Amer. Sterilizer Co., 2400 W. 23rd, Erie, Pa.
Industrial Optics Optical Div. 337-5th St., Newark, N.J. 07107
Infrared Industries, Incorporated PO Box 989, Santa Barbara, Calif. 93102
Instrumentation Lab, Incorporated 9 Galen St., Watertown, Mass. 02171
Instrumentation Specialties Company 4700 Superior St., Lincoln, Nebraska 68504
Instruments for Research & Industry 108 Franklin Ave., Cheltenham, Pa. 19012
Interlab Incorporated 109 Wheeler Ave., Pleasantville, N.Y. 10570
International Chemical & Nuclear Corporation 801 N. Lake St., Burbank, Calif. 91502
International Controls Corporation 88 Clinton Rd., Fairfield, NJ 70006 Cryogenics Div.
International Crystal Labs 120-A Coit St., Irvington, N.J. 07111
International Crystal Mfg., Incorporated 122 Croit St., Irvington, N.J. 07111
International Equipment Company 300 2nd Ave., Needham Heights, Mass. 02194
International Light, Incorporated Dexter Industrial Breen, Newburyport, Mass. 01950
International Research & Development Corporation 6150 Huntley Rd., Worthington, Ohio
International Sales Associates 115 E. Maple Ave., Langhorne, Pa. 19047
International Transducers Po Box 3385, Santa Barbara, Calif. 93105
In-val-Company 3102 Charles Page Blvd., Tulsa, Oklahoma 74127
Ionics, Incorporated 65 Grove St., Watertown, Mass. 02171
Iota-Cam Corporation 28 Teal Rd., Wakefield, Mass. 01880
Isomet Corporation 433 Commercial Ave., Palisades Park, N.J. 07650
Ithaco, Incorporated 413 Taughannock Blvd., Ithaca, N.Y. 14850
ITT 15191 Bledsoe St., San Fernando, Calif. 01342
Itt Hammel-Dahl Div. of Intern. Tel & Tel 175 Post Rd., Warwich, R.I. 02888
James Electronics, Incorporated Instrum. Div. 4050 N. Rockwell St., Chicago, Ill 60618
James Instrument 26 Sparta Dr., Short Hills, N.J. 07078
Jarell Ash Division 590 Lincoln St., Waltham, Mass. 02154
Jeolco, USA 477 Riverside Ave., Medford, Mass. 02155
Jewel Electric Products, Incorporated 17-10 Willow St., Fairlawn, N.J.
Johns-Manville Sales Corporation 22 E. 40th St., NY, NY 10016 Indus. Asbes. Cement Div.
A. D. Jones Optical Works, Incorporated 64 Cambridge St., Burlington, Mass 01803
Johnson Service Company 507 E. Michigan, Milwaukee, Wisconsin 53201
Julie Research Labs, Incorporated 211 W. 61st St., New York, N.Y. 10023
Kahl Scientific Instrument Corporation 737 W. Main St., El Cajon, Calif. 92022
Kaman Nuclear 1700 Garden of the Gods Rd., Colorado Springs, Colo. 80907
Keleket X-ray 1601 Trapelo Rd., Waltham, Mass. 02154

Manufacturers Continued

Kelvin Hughes America Corporation PO Box 1951, Annapolis, Md. 21404
Kemlite Labs, Incorporated 1819 W. Grand Ave., Chicago, Illinois 60622
Kensington Scientific Corporation 1165 67th St., Oakland, Calif. 94608
Wayne Kerr Corporation 22 Frink St., Montelair, N.J. 07042
Keuffrel & Esser Company 300 Adams St., Hobokin, N.J. 07030
Kewaunee Manufacturing Company End S. Center St., Adrian, Michigan 49221
Kewaunee Scientific Equipment Company 5013 S. Center St., Adrian, Mich. 49221
Kewaunee Technical Furniture Company Taylorsville Rd., Box 1111, Statesville, N.C.
Kieley & Mueller, Incorporated 64 Genung St., Middletown, N.Y. 10941
Walter Kidde & Company, Incorporated 1077 Main St., Belleville, N.J. 07109
Kinnear Corporation 736-786 Fields Ave., Columbus, Ohio
Klett Manufacturing Company Incorporated 179 E. 87th St., New York, N.Y. 10028
Knape & Vogt Manufacturing Company 2700 Oak Industrial Dr., NE, Grand Rapids, Mich.
Kollmorgen Color Systems 67 Mechanic St., Attleboro, Mass. 02703
Kollsman Instrument Corporation 575 Underhill Blvd., Syosset, N.Y. 11791
Kontes Glass Company Spruce St., Vineland, N.J. 08360
Kopp Glass Incorporated PO Box 8255, Pittsburgh, Pa. 15218
Korad Corporation 2520 Colorado Ave., Santa Monica, Calif. 90406
Krautkramer Ultrasonics, Incorporated 1 Research Dr., Statford, Conn. 06497
Krebs Electric & Manufacturing Company, Incorporated 237-239 Lafayette St., N.Y., N.Y.
Kressilk Products, Incorporated 73 Murray St., New York, N.Y. 1007
Krohn-Hite Corporation 580 Mass. Ave., Cambridge, Mass. 02139
L and R Manufacturers Company 573 Elm St., Kearney, N.J.
LKB Instruments, Incorporated 12221 Parklawn Dr., Rockville, Md. 20852
LND, Incorporated 3230 Lawson Blvd., Oceanside, N.Y. 11572
Labconco 8811 Prospect Ave., Kansas City, Mo. 64132
Labs-Items Associates PO Box 321, San Francisco, Calif. 94101
Lab-Line Instruments Lab-Line Plaza, Melrose Park, Ill. 60160
Laboratory Craftsmen 2925 Bartells Dr., Beliot, Wisconsin 53511
Laboratory for Electronics, Incorporated 1079 Commonwealth Ave., Boston, Mass. 02215
Lachat Chemicals, Incorporated 20200 Ashland Ave., Chicago Heights, Ill. 60411
La Motte Chemical Products, Company Chestertown, Md. 21620
Lamson & Goodnow Manufacturing Company 45 Conway St., Shelburne Falls, Mass. 01370
La Pine Scientific Company 6001 S. Knox Ave., Chicago Ill. 60629
Laser Optics 24 Mill Plain Rd., Danbury, Conn. 06810
Laser Technology, Incorporated 10624 Ventrua Blvd., N. Hollywood, Calif. 91604
Lear Siegler, Inc. 714 N. Brookhurst St., Anaheim, Calif. 92803 Electronic Instru. Div.
Lear Siegler, Inc. Laser Systms. Center, 313 N. 1st St., Ann Arbor, Mich. 48103
Lear Siefler, Inc. 617 Front St., Toledo, Ohio First Lighting Products
Leeds & Northrup Company 4901 Stenton Ave., Philadelphia, Pa. 19144
LeHigh Valley Electronics, Incorporated PO Box 125, Fogelsville, Pa. 18051
Leitz, Incorporated 468 Park Ave. S., New York, N.Y. 10016
Le Mont Scientific, Incorporated Pike St., Lemont, Pa. 16851
Lewis Corporation Main St., Woodbury, Conn. 06798
Lexington Instruments Corporation 241 Crescent St., Waltham, Mass. 02154
Liberty Electric Company, Incorporated Madison Ave & Lehr St., Indianapolis, Ind.
Lindberg, Hevi-Duty 2450 W. Hubbard St., Chicago, Ill. 60612
Ling Electronics 1515 S. Manchester Ave., Anaheim, Calif. 92802
Lipshaw Manufacturing Company 7446 Central Ave., Detroit, Mich. 48210
Listening, Incorporated 6 Garden St., Arlington, Mass. 02174
Arthur D. Little 25 Acorn Park, Cambridge, Mass. 02140
Litton Industries Airtron Div., 200 E. Hanover Ave., Morris Plains, N.J. 07950

Manufacturers Continued

Litton Industries Atherton Div., 974 Commercial St., Palo Alto, Calif. 94303
Litton Industries, Incorporated Electron Tube Div, 960 Industrial Rd, San Carlos,Cal.
Logetronics, Incorporated 15 Stepar Pl., Huntington Station, NY 11746 Photomech. Div.
London Company 811 Sharon Dr., Cleveland, Ohio 44145
Lourdes Instrument Corporation 148 Sweet Hollow Rd., Old Bethpage, N.Y. 11804
Paul Luchenbach & Company 312 W. 231st St., New York, N.Y.
Lucifer Furnaces, Incorporated 2048 Bunnell Rd., Warrington, Pa. 18976
Luft Instruments, Incorporated Old Winter St., Lincoln, Mass. 01773
MSA Research Corporations EvansCity, Pa. 16033
MSE Incorporated, Sold by London Co. 811 Sharon Dr., Cleveland, Ohio 44145
Macalaster Bicknell Company of Conn., Inc. 181 Henry St., N. Haven, Conn. 06508
Macalaster Bicknell Company of N.J., Inc. North & Depot Sts., Millville, N.J. 08332
Macalaster Bicknell Company of N.Y., Inc., PO Box 5, Eastwood Station, Syracuse, N.Y.
Macalaster Scientific Company 186 3rd Ave., Waltham, Mass. 02154
MacBeth Corporation PO Box 950, Newburgh, N.Y. 12550
MacDermid of Bristol, Inc. Bristol, Conn.
Machlett Labs, Inc. 1063 Hope St., Springdale, Conn. 06879
Macrosonic Corporation 880 Elson St., Rahway, N.J. 07065
Magnaflux Corporation 7300 W. Lawrence Ave., Chicago, Ill. 60656
Magnavox Company 270 Park Ave., New York, N.Y.
Magnion, Incorporated 144 Middlesex Turnpike, Burlington, Mass. 01803
E. F. Mahady Company Div. of Will Ross, Inc. of Mass. Cambridge, Mass. 02141
Malaker Corporation W. Main St., High Bridge, N.J. 08823
Mallinckrodt Chemical Works 2nd & Malinckrodt Sts., St. Louis, Mo. 63160
David W. Mann Company 174 Middlesex Turnpike, Burlington, Mass. 01803
Manufacturers Engineering & Equipment Corporation 250 Titus Ave., New York, N.Y. 10010
Maoalaster Scientific Company 186 3rd Ave., Waltham, Mass. 02154
Marconi Company 220 E. 23rd St., New York, N.Y. 10010 Sold by Calvert Electronics, Inc.
Marietta Apparatus Company 118 Maple St., Marietta, Ohio 45750
Marine Acoustical Services, Incorporated 1975 NW S. River Dr., Miami, Fla. 33125
Marine Advisors, Incorporated 7440 Girard Ave., La Jolla, Calif. 92037
Marshall C & E Company 1445 W. Jackson Blvd., Chicago, Ill.
Maser Optics, Incorporated 89 Brighton Ave., Boston, Mass. 02134
Massey Dickinson Company, Incorporated 9 Elm St., Saxonville, Mass. 01701
Mastercraft Medical & Instrument Corporation 43-10 23rd St., L. Island City, N.Y.
Matec, Incorporated 60 Montebello Rd., Warwick, R. I. 02886
Materials Analysis Company 1060 E. Meadow Circle, Palo Alto, California 94303
Materials Research Corporation Rte. 303, Orangeburg, N.Y. 10962
Matheson Coleman & Bell East Rutherford, N.J. 07073
Matheson Scientific 1850 Greenleaf Ave., Elk Grove Village, Ill. 60007
Matshushita Electric Corp. of America 200 Park Ave., New York, N.Y.
McBee Lab Sourdough Rd., Bazeman, Montana 59715
McKee-Pederson Instruments PO Box 322, Danville, Calif. 94526
McPherson Instrument Corporation 530 Main St., Acton, Mass. 01720
Medalist Industries Oshkosh, Wisconsin
Medcraft Electronics Box 542, Shippack, Pa. 19474
Med-Science Electronics, Incorporated 2647 Locust Ave., St. Louis, Mo. 63103
Medtronic, Incorporated 3055 Old Highway 8, Minneapolis, Minn. 55418
Meinecke & Co. Harrisburgh Expressway & Shaw Rd., Baltimore, Md.
Melcor Electronics Corporation 1750 N. Highway, Farmingdale, N.Y. 11735
Melton Company, Incorporated 20 W. Main, PO Box 1145, Oklahoma City, Oklahoma 73101
Merco Products, Inc. 1299 Bethal Dr., Eugene, Oregon
Mercury Instruments, Incorporated 3940 Virginia Ave., Cincinnati, Ohio 45227

Manufacturers Continued

Metalab Equipment Company 270 Duffy Ave., Hicksville, N.Y. 11802
Metrix, Incorporated PO Box 6222, Denver, Colo. 80206
Metronics Associates, Incorporated 3201 Porter Dr., Palo Alto, Calif. 94304
Microdot, Incorporated 220 Pasadena Ave., S. Pasadena, Calif. 91030
Micromatic Electronic Ranges, Inc. 3520 W. National Ave., Milwaukee, Wisc. 53215
Micro-Now Instruments Company, Inc. 6124 N. Pulaski Rd., Chicago, Ill. 60646
Micro-Tol Engineering Corporation PO Box 154, State College, Penn. 16801
Microwave Associates, Incorporated South Ave., Burlington, Mass. 01803
Microwave Electric Corporation & Paramps 3165 Porter Dr., Mountain View, Calif.
Microwave Energy, Incorporated West Peabody, Mass.
Midwestern Instrument 6422 E. 41st St., Tulsa, Oklahoma 74135
Adolf Miller Company PO Box 6001, Providence, R.I. 02904
Miller & Weber, Incorporated 1637 George St., Ridgewood, Brooklyn, N.Y. 11227
Millers Forge Manufacturing Corporation 30 E. 42nd St., New York, N.Y. 10017
Milwaukee Faucets, Incorporated 4250 N. 124th St., Milwaukee, Wisc. 53222
Minibest Company PO Box 446, Buena Vista Station, Miami, Fla. 33137
Minneapolis Honeywell Reg. Company 2953 4th Ave., S., Minneapolis, Minn.
Miskella Infra-red Company 7301 Grand Ave., Cleveland, Ohio 44104
Missile Component Cleaning Laboratories 2226 N. 10th St., Philadelphia, Pa.
Mist 02 General Equipment Company 2711 Adeline St., Oakland, Calif.
Modern Lab Equipment Company 1811 1st Ave., New York, N.Y. 10028
Molded Products 26 Payson Ave., Easthampton, Mass. 01027 Div. of E.hampton Rubber Co.
Monsanto Company 800 N. Lindbergh Blvd., St. Louis, Mo. 63166
Monsanto Research Corporation Nuclear Sources Dept. 1515 Nicholas Rd., Dayton, Ohio
Mosler Safe Company 320 Park Ave., New York, N.Y. 10022
Motorola, Incorporated Gov't. Electronics Div., 8201 E McDowell Rd., Phoenix, Ariz.
Muffoletto Optical Company, Incorporated 6100 Everall Ave., Baltimore, Md. 21206
Muirhead Instruments, Incorporated 1101 Bristal Rd., Mountainside, N.J. 07092
Multisonic Incorporated 9615 Meech Ave., Cleveland, Ohio
Nalge Company 75 Panorama Creek Dr., Rochester, N.Y. 14625
National Appliance Company PO Box 23008, Portland, Oregon 97223
National Biological Supply Company, Incorporated 2325 S. Mich. Ave., Chicago, Ill.60616
National Electrical Union Emerson Television & Radio Corporation Stamford, Conn.
National Instrument Labs, Incorporated 12300 Parklawn Dr., Rockville, Md. 20852
Karl A. Neise, Incorporated 56-02 Roosevelt Ave., Woodside, N.Y. 11377
New Brunswick Scientific Company, Inc. 1130 Somerset St., New Brunswick, N.J. 08903
Newport Laboratories Box 2087, Newport Beach, Calif. 92663
Newport Labs Incorporated 200 W. Central, Santa Ana, Calif. 92707
Nester/Faust Manufacturing Corporation 2401 Ogletown Rd., Newark, Del. 19711
New England Nuclear 575 Albany St., Boston, Mass. 02118
New York Laboratory Supply Co., Inc. 76 Varick St., New York, N.Y. 10013
Neyrpic, Incorporated 375 Park Ave., New York, N.Y. 10022
Nicolet Industries, Incorporated 1 Nicolet Ave., Florham, N.J. 07932
Nikon, Incorporated Instrument Div., 623 Stewart Ave., Garden City, N.Y. 11530
North American Philips 525 W. 52nd St., N.Y., N.Y. Norelco Medical & Dental Div.
Northern Electric Company 5224 N. Kedzie Ave., Chicago, Ill.
Norton Company New Bond St., Worchester, Mass. 01606
Notifer Company (Empact Corp.) 3700 N. 56th St., Lincoln, Nebraska 68504
Novatronics, Incorporated 500 N. Andrews Ave., Ext., Box 878, Pompano Beach, Fla.33061
Nuclear-Chicago Corporation 333 E. Howard Ave., Des Plaines, Ill. 60018
Nuclear Equipment Chemical Corporation 165 Marine St., Farmingdale, N.Y. 11735
Nuclear Magnetic Resonance 1410 Greensburg Rd., N. Kensington, Pa. 15068

Manufacturers Continued

Nuclear Materials & Equipment Corporation 609 Warren Ave., Apollo, Pa. 15613
Nuclear Supplies, Incorporated PO Box 312, Encino, Calif. 91316
Nucleus PO Box R, Oak Ridge, Tenn. 37830
Nuclide Corporation 642 E. College Ave., State College, Pa. 16801
Nuclide Corporation AGV div., 916 Main St., N. Acton, Mass. 01720
Nurnberg Thermometer Company, Inc. 124 Livingston St., Brooklyn, N.Y. 11201
Oakite Products Incorporated 50 Valley Rd., New York, N.Y.
OAL Associates 155 Sullivan Lane, Westbury, N.Y. 11590
Ocean Research Equipment, Incorporated Falmouth, Mass. 02541
Ocean Science & Engineering, Inc. 4905 Del Ray Ave., Washington, D. C. 20014
Ohaus Scale Corporation 1050 Commerce Ave., Union, N.J. 07083
Ohio Semitronics 1205 Chesapeake Ave., Columbus, Ohio 43212
Olympic Instruments, Incorporated Vashon, Wash. 98070
Onyx Designs Sunset Ave. & Browne Rd., Asbury Park, N.J. 07712
Opextro Products Co. 1770-72 No. Workman St., Los Angeles, Calif. 90031
Optics Technology 901 California Ave., Palo Alto, Calif. 94304
Optometric Instruments 8255 Beverly Blvd., Los Angeles, Calif. 90048
Optovac, Incorporated 61 Summer, North Brookfield, Mass. 01535
Oriel Optics Corporation 1 Market St., Stamford, Conn. 06902
Overland Electric 3110 S. 61st Ave., Cicero, Ill.
Owens-Illinois, Incorporated PO Box 1035, Toledo, Ohio 43601 Owens-Ill. Bldg.
PMF Electronics, Incorporated 124 E. 3rd St., Dayton, Ohio 4502
PRD Electronics, Incorporated 1200 Prospect Ave., Westbury, N.Y. 11590
Pacific Electric Motor Company 1009 66th Ave., Oakland, Calif. 94621
Pacific Transducer Los Angeles, Calif.
Packard-Bell Electronics 12333 W. Olympic Blvd., Los Angeles, Calif. 90064
Pall Corporation 32 Sea Cliff Ave., Glen Cove, N.Y.
Parks Electronics Lab 419 SW 1st St., Beaverton, Oregon 97005
Parks Electronics Labs Beaverton, Oregon
Parr Instrument Company Incorporated 211 53rd St., Moline, Ill. 61265
Partsco Incorporated Labco Div., 3003 Lamb Ave., Columbus, Ohio 43219
Partswash Equipment Company, Inc. 152 Willard Ave., Zewington, Conn.
Patented Products Corporation Danville, Ohio
PEK 825 East Evelyn Ave., Sunnyvale, Calif. 94086
Peninsula Associates 1447 Bayshore, Palo Alto, Calif. 94303
Pennsylvania Scale Company 21 Grayhill Rd., Leola, Pa. 17540
Peremy Equipment Company, Incorporated Dept. GI, Columbus, Ohio 43212
Perfection Mica Company 1332 N. Elston Ave., Chicago, Ill. 60622 Magn. Shield Div.
Perkin-Elmer Corporation Electro Opt. Div., 131 Danbury Rd., Wilton, Conn. 06897
Perkin-Elmer Corp. Ultek Div., PO Box 10920, Palo Alto, Calif. 94303
Perkin-Elmer Corp. 723 G Main Ave., Norwalk, Conn. 06852
Permanent Magnet Company 4437 Bragdon St., Indianapolis, Indiana 46226
Leonard Peterson & Company, Incorporated 1222 Fullerton Ave., Chicago, Ill. 60614
Phelps-Dodge Electronic Products 60 Dodge Ave., N. Haven, Conn. 06473
Philadelphia Scientific Glass Company 9th & Ridge Ave., Perkosie, Pa.
Philco-Ford Corp. Sierra Electronic Operation 3885 Bohannon Dr., Menlo Park, Cal.94025
Philco-Ford Corp. Microelectronics Div., 2920 San Ysidro Way, Santa Clara, Cal. 95051
Philco-Ford Corp. Tioga & C Sts., Philadelphia, Pa.
Philips Electronic Instruments 750 S. Fulton Ave., Mt. Vernon, N.Y. 10550 Norelco Div
Phipps & Bird, Inc. Mfg. Div., 303 S. 6th St., Richmond, Va. 23205
Photobell Company, Incorporated 12 G E. 22nd St., New York, N.Y. 10010
Photronic, Incorporated 411 Cheltana Ave., Jenkingtonwn, Pa.19046

Manufacturers Continued

Photovolt Corporation 1115 Briadway, New York, N.Y. 10010
Phoenix Precision Instruments Co. 3803-05 N. 5th St., Philadelphia, Pa. 19140
Phys-Chemical Research Corporation 36 E. 20th St, New York, N.Y. 10003
Physicians & Hospitals Supply Company 1400 Harmon Pl., Minneapolis, Minn. 55403
Physicon Company PO Box 232, Boston, Mass. 02116
Picker Corporation Picker AEI Div., 1275 Mamaroneck Ave., White Plains, N.Y. 10605
Pinkerton Detective Agency 61 Sutton Rd., Webster, Mass. 01570
Pilot Radio Corporation 100 Electra Lane, East Station, Yonkers, N.Y.
Pioneer Central, Div. of Bendix Corp., Hickory Grove Rd., Davenport, Iowa
Plas-Labs 917 E. Chilson St., Lansing, Mich. 48906
Polacoat, Incorporated 9750 Conklin Rd., Blue Ash, Ohio 45242
Polan Industries, Incorporated PO Box 1720, Huntington, W. Va. 25718 Zenith Opt. Div.
Polysciences, Incorporated Paul Valley Industrial Park, Warrington, Pa. 18976
Polytronics Company 582 Bathurst St., Toronto 4, Canada
Powdertron Division TR Expressway Industrial Park, Plainview Long Island, N.Y.
Powers Regulator Company 3400 Oakton St., Skokie, Ill. 60076
Pratt Whitney West Hartford, Conn.
Precision Cells Incorporated 401 Broadway, New York, N.Y. 10013
Precision Distillation Box 578, Woodland Hills, Calif. 91366
Precision Glass Products PO Box 145, Oreland, Pa. 19075
Precision Scientific Company 3737 Cortland St., Chicago, Ill. 60647
Precision Thermometer & Instrument Co. Southampton Industrial Park, Southampton, Pa.
Preiser Scientific, Inc. 900 MacCorkle Ave., SW, Charlestown, W. Va. 25322
Premco Instrument Company 2006 E. 1st St.,Austin, Texas 78702
Princeton Applied Research Corporation PO Box 565, Princeton, N.J. 08540
Princeton Gamma-Tech, Incorporated PO Box 641, Princeton, N. J. 08540
Process & Instruments Corporation 1943 Broadway, Brooklyn, N.Y. 11207
Products & Services for Research Inc. PO Box 613, Oak Ridge, Tenn. 37830
Professional Surgical Supply Co., Inc. 74-15 Roosevelt Ave., Jackson Heights, N.Y.
Profexray Incorporated Maywood, Ill.
Pulse Engineering Incorporated Velonex Div., 560 Robert Ave., Santa Clara, Calif.95050
Pyrocell Manufacturing Company 91 Carver Ave., Westward, N.J. 07675
Pyrotel Corporation 225 Valley Place, Mamaroneck, N.Y. 10543
Quan-Tech Labs, Incorporated 43 S. Jefferson Rd., Whippany, N.J. 07981
Quantum Electronics 3120 Crow Canyon Rd., San Ramon, Calif. 94583
Quartz Products Corporation PO Box 628, Plainfield, N.J. 07061
Questar Corporation New Hope, Pa. 18938
Quindar Electronic, Incorporated 60 Fadem Rd., Springfield, N.J. 07081
Radar Detection Systems, Incorporated East Norwich, N.Y.
Radar Devices Manftg. Corp. 22003 Harper Ave., St. Clair Shores, Mich. 48080
Radiation Dynamics, Incorporated 1800 Shames Dr., Westbury, N.Y. 11590
Radiation Equipment 26 Sparta Dr., Short Hills, N.J. 07078
Radiation Materials Corporation 124 Cavalry St., Waltham, Mass. 02145
RCA Electronic Components 415 S. 5th St., Harrison, N.J. 07029
RCA Scientific Instruments 201 S. Front St., Camden, N.J. 08102
Radio Corporation of America 32 Rockefeller Plaza, New York, N.Y.
RCA Lancaster. Pennsylvania
Radio Frequency Company, Incorporated 50 Park St., Medfield, Mass. 02052
Radioptics, Incorporated 10 Dupont St., Plainview, N.Y. 11803
Ramsay Engineering Company 717 N. Anaheim Blvd., Anaheim, Calif. 92805
Racsher & Betzold, Incorporated 730 N. Franklin St., Chicago, Ill. 60610
Rasco, Incorporated 4050 N. 34th St., Milwaukee, Wisc. 53216

Manufacturers Continued

Ray Proof Corporation 50 Keeler Ave., Norwalk, Conn. 06854
Raytheon Company Microwave & Power Tube Div., 130 2nd Ave., Waltham, Mass. 02154
Raytheon Co. Accelerator & Equipment Operations, 190 Willow St., Waltham, Mass. 02154
Raytheon Corporation Marine Products Operation 213 E. Grand Ave., S. Fran., Cal. 94080
Raytheon Corp. Submarine Signal Div., 1847 W. Main Rd., Portsmouth, R. I. 02871
Raytheon, Richards Norwalk Conn.
Reactor Experiments, Inc. 963 Terminal Way, San Carlos, Calif. 94070
Redford Corporation 968 Albany-Shaker Rd., Latham, N.Y. 12110
Reeve Electronics, Incorporated 611 W. Lake St., Chicago, Ill.
Reeves Electric D. George/Roper Corporation Kankakee, Ill.
Reflex Controls Corporation 15 Stepar Pl., Huntington Station, N.Y. 11746
C. Reichert Sold by Amer. Optical Corp. Buffalo, N.Y. 14215
Resalab Incorporated 4000 Campbell Ave., Menlo Park, Calif. 94025
Research, Incorporated R-I Controls Div. PO Box 6164, Edina Branch, Minneapolis,Minn.
Research Mftg. Corp. Remaco Div., PO Box 6056, San Diego, Calif. 92106
Research Media, Incorporated 163 Eileen Way, Syosset, N.Y. 11791
RFL Industries, Incorporated Boontown, N.J. 07005
Rhoades Rubber Corporation 150 Pleasant St., Easthampton, Mass. 01027
Ritter Company, Incorporated Rochester, N.Y.
Riverbanks Labs Dept. of Engineering, PO Box 65, Geneva, Ill. 60134
Robertshaw Controls Company PO Box 400, Knoxville, Tenn. 37901 Fulton Sylphon Div.
Rockland Laboratories, Incorporated PO Box 57, Tappan, N.Y. 10983
Roselawn Laboratories, Incorporated 7330 N. Miami Ave., Box 38-130, Miami, Fla. 33138
Paul Rosenthal, Incorporated 300 Northern Blvd., Great Neck, N.Y. 11021
Harry Ross 61 Reade St., New York, N.Y. 10017
Royal Brass Manufacturing Company 1420 E. 43rd St., Cleveland, Ohio 44103
Rudolph Instrument Engineering Company 61 Stevens Ave., Little Falls, N.J. 07424
O. C. Rudolph & Sons, Incorporated PO Box 446, Fairfield, N.J. 07006
Ruska Instrument Corporation PO Box 36010, Houston, Texas 77036
Saam Scientific 26 Sparta Dr., Short Hills, N.J. 07078
Sadtler Research Labs, Inc. 3316 Spring Garden St., Philadelphia, Pa. 19104
Sage Instruments, Incorporated 2 Spring St., White Plains, N.Y. 10601
Saint John X-ray Laboratory Califon, N.J. 07830
Samson-United Corporation University Avenue & Weiss Blvd., Rochester, N.Y.
Sandlers Laboratories Bartley Road, Jackson, N.J. 08527
San'Ei Instrument Company,Limited 43 Plymouth Rd., Great Neck, N.Y. 11023
Santa Barbara Research Center 75 Coramar Drive, Goleta, Calif. 93017
Santa Rita Technology, Incorporated 1040 O'Brien Dr., Menlo Park, Calif. 94025
Sargeant-Welch Company 4647 Foster Ave., Chicago, Ill. 60630
Schaar Scientific Company 7300 West Montrolse Ave., Chicago, Ill. 60634
Scheer Instrument 26 Sparta Dr., Short Hills, N.J. 07078
Scherer Company 291 Coral Circle, El Segundo, Calif. 90245
Schoeffrel Instrument Corporation 24 Booker St., Westwood, N.J. 07675
Schuco Scientific 110 5th Ave., New York, N.Y. 10011
E. W. Schultheis Corporation 812-814 Wyckoff Ave., Brooklyn, N.Y. 11227
Schultz Instruments, Incorporated PO Box 13385, Gainesville, Fla. 32601
Schwarzer Corporation 46 Salmi Rd., Framingham, Mass. 01701
Science Direct 11 W. 42nd St., New York, N.Y. 10036
Science Research Passiac, N.J.
Scientific Advances, Incorporated 1400 Hally Ave., Columbus, Ohio Sensotec Div.
Scientific-Atlanta, Incorporated PO Box 13654, Atlanta, Georgia 30324
Scientific Educational Products Company 30 E. 42nd St., New York, N.Y. 10017

Manufacturers Continued

Scientific Glass Apparatus 735 Broad St., Bloomfield, N.J. 07003
Scientifica & Cook Electronics Corporation 2 Railroad Pl., Wisport, Conn. 06880
Scintillonics, Incorporated PO Box 701, Fort Collins, Colorado 80521
Scott Instrument Laboratories 111 Powder Mill Rd., Maynard, Mass. 01754
Scott Testers, Incorporated 101 Blackstone St., Providence, R.I. 02901
Sealomatic Electronics Corporation 69 Scott Ave., Brooklyn, N.J.
Sears-Kenmore Distributors Roper Mfg. Kankakee, Ill.
Security Parachute Company 295 W. 141st Ave., San Leondio, Calif.
Seederer-Kohlbusch, Incorporated 25 S. Van Brunt St., Englewood, N.J. 07631
Selectron Products, Inc. 10401 Decatur Road, Philadelphia, Pa. 19154
Semens Medical of America 68 S. Liberty Ave., Union, N.J. 07083
Semi-Elements, Incorporated Saxonburg Blvd., Saxonburg, Pa. 16056
Setchell Carlsin, Incorporated New Brighton, St. Paul, Minnesota
Shandon Scientific Company, Incorporated 515 Broad St., Sewickley, Pa. 15143
Sharp Electronics Corporation 178 Commerce Rd., Carlstadt, N.J.
Sheffield Automation & Measurement Div. of Bendix, Springfield & Thomas, Dayton, Ohio
E. H. Sheldon Equipment Company Nims St., Muskegon, Michigan 49443
Sherer-Gilitt Company S. Kalamazoo Ave., Marshall, Mich. 49068 Environmental Div.
Sherwood Medical Industries, Incorporated 1831 Olive St., St. Louis, Mo. 63103
Hayes G. Shrimp, Incorporated 870 Willis Ave., Albertson, N.Y. 11507 Tintometer Div.
Siemens Munich, Germany
Siemens America, Incorporated 350 5th Ave., New York, N.Y. 10001
Siemens America Dental Div., 110-39 44 I Dr., Long Island City, N.Y.
Sierra Electronic Operation Menlo Park, Calif.
Sigma Instruments, Incorporated 170 Pearl St., Braintree, Mass. 02185
Sigmamotor 3 N. Main St., Middleport, N.Y. 14105
Signatron Incorporated Telemetry Div., 17124 S. Western Ave., Gardena, Calif. 90247
Simonsen Radio 215-10 Queens Blvd., Kew Gardens, N.Y. 11415 Sold by Supervisors, Inc.
Singer Company 915 Pembroke St., Bridgeport, Conn. 06608
Singer-General Precision, Inc. 1150 McBride Ave., Little Falls, N.J. 07424 Kearfott Gr.
Singer-General Precision, Inc. Link Group, Binghamton, N.Y. 13902
Smith Kline Instruments Company 1500 Spring Garden St., Philadelphia, Pa. 19101
Solid State Research Corporation 640 Coors Ave., SW, Albuquerque, N. Mexico 87105
Southern Cross Manufacturing Corporation 14 N. Main St., Chambersburg, Pa. 17201
Southern Desk Company Div. of Drexel Enterprises, Inc., PO Box 2187, Hickory, N.C.
Southern New England Ultraviolet Company 954 Newfield St., Middletown, Conn. 06457
Space Lattice Company Thermodyne Div. 14 Avon Pl., Cambridge, Mass. 02140
Special Optics PO Box G, Cedar Grove, N.J. 07009
Specialty Glass Company 536 Lake Shore Dr., Chicago, Ill. 60611
Spectra-Physics, Incorporated 1255 Terra Bella Ave., Mountain View, Calif. 94041
Spectrum Techniques PO Box 9321, Denver, Colo. 80209
Sperry Marine Systems Div. Sperry Rand Corp., Charlottesville, Va. 22901
Spex Industries, Inc. 3880 Park Ave., Metuchen, N.J. 08840
Spitz Laboratories, Inc. Yorklyn, Delaware 19736
W. F. Sprengnether Instrument Co., Inc. 4567 Swan Ave., St. Louis, Mo. 63110
Stackpole Carbon Company Stackpole St., St. Marys, Pa. 15857
Standard Scientific Div. of IPCO Hospital Supply Corp., 808 Broadway, New York, N.Y.
Standard X-ray Company 2600 S. Kostner Ave., Chicago, Ill. 60623
Statham Instruments, Incorporated 2230 Statham Boulevard, Oxnard, Calif. 93030
Sterling Glass Incorporated 2315 W. 136th St.,Blue Island, Ill. 60406
Still-Man Equipment Corporation 429 E. 16th St., New York, N.Y.
Stocker & Yale, Incorporated Rte. 128 & Brimbal Ave., Beverly, Mass. 01915

Manufacturers Continued

C. H. Stoelting Company 424 North Homan Ave., Chicago, Ill. 60624
Stoker-Equipment Division Pennsalt Chemicals Corp. 5500 Tabor Rd., Phila., Pa. 19120
Strobe Masters 160 5th Ave., New York, N.Y. 10010
Strong Electronic Corporation 87 City Park Ave., Toledo, Ohio 43601
Sunbeam Corporation 5600 Roosevelt Rd., Chicago, Ill.
Sunbeam Vacuum Technology Corporation 49 Pollard St., N. Billerica, Mass. 01862
Sunshine Scientific Instruments 1810 Grant Ave., Philadelphia, Pa. 19115
Superior Air Products 132 Malvern St., Newark, N.J. 07105
Sylvania Electric Products, Incorporated PO Box 188, Mountain View, Calif. 94040
Sylvania Lighting Products 160 Boston St., Salem, Mass.
Symphonic Electronic Corporation 470 Park Ave., S., New York City, N.Y. 10016
Systron-Donner Corporation 888 Galindo St., Concord, Calif. 94520
T & S Brass and Bronze Works, Inc. Lab-Flo Div., 128 Magnolia Ave., Westbury, LI, NY
TRW Instruments 139 Illinois St., El Segundo, Calif. 90245
TAFA Division Humphreys Corp. 180 N. Main St., Concord, N.H. 03301
Talley Industries, Incorporated DTI Div., PO Box 1040, Tempe, Ariz. 85281
Tappan Company 480 ParkAve., W, Mansfield, Ohio
Taylor Instrument Companies 95 Ames St., Rochester, N.Y. 14601
Taylor Manufacturing Company 1353 W. 2nd, PO Box 1069, Taylor, Texas 76574
TE Company 505 E. Monticito St., Santa Barbara, Calif. 93103
TECA Corporation 220 Ferris Ave., White Plains, N.Y. 10603
Tech Scientific Supply Company 1121 NW 29th St., Miami, Fla. 33127
Technical Instrument Company 348 6th St., San Francisco, Calif. 94103
Technical Instruments Incorporated 441 Washington Ave., North Haven, Conn. 06473
Technical Measurements 441 Washington Ave., North Haven, Conn. 06473
Technical Products Company 6670 Lexington Ave., Los Angeles, Calif. 90038
Technician Corporation Ardsley, N.Y. 10502
Tektronix, Incorporated PO Box 500, Beaverton, Oregon 97005
Teledyne Analytical Instruments 333 W. Mission Dr., San Gabriel, Calif. 91776
Telemedics, Vector Div. United Aircraft Corporation, Southampton, Pa. 18966
Television Manufacturers of America 1020 Noel Ave., Wheeling, Ill. 60090
Temperature Engineering Div. Piasecki Aircraft Corp., 1 Tempcor Blvd., Riverton, N.J.
Tem-Pres Research, Incorporated 1401 S. Atherton St., State College, Pa. 16801
Texas Instruments, Incorporated PO Box 66027, Houston, Tex. 77006 Indust. Prod. Div.
Texas Nuclear Division Nuclear Chicago Corp. 1901 Research Blvd., Austin, Tex.78757
Texscan Corporation 4610 N. Franklin Rd., Indianapolis, Ind. 46446
Thermal American Fused Quartz Company PO Box 127, Montville, N.J. 07045
Thermal Systems, Incorporated 15100 S. Broadway, Gardena, Calif.
Thermolyne Corporation 2555 Kerper Blvd., POBox 797, Dubuque, Iowa 52001
Thermometer Corporation of Amer. 567 E. Pleasant St., Springfield, Ohio 45501
Thermovac Industries Corporation 41 Decker St., Copiague, N.Y. 11726
Thermoware Electric Corporation 1250 Rockaway Ave., New York, N.Y.
Arthur H. Thomas Company Vine St. at 3rd, Philadelphia, Pa. 19105
Thwing-Albert Company 10960 Dutton Rd., Philadelphia, Pa. 19154
Torsion Balance Company Christian Becker Clifton, N.J. 07013
Toshiba of America 530 5th Ave., New York, N.Y.
Tracer Lab Division Richmond, Calif.
Tracor, Incorporated 6500 Tracor Lane, Austin, Texas 78721
Trans-Sonics, Incorporated PO Box 326, Lexington, Mass. 02173
Travenol Labs, Incorporated PO Box 2214, Costa Mesa, Calif. 92626 Hyland Div.
Trippensee Planetarium Company, Inc. 2200 S. Hamilton St., Saginaw, Mich. 48602
Henry Troemner, Incorporated 6825 Greenway Ave., Philadelphia, Pa. 19142
Turner Corporation 821 Park Ave., Sycamore, Ill. 60178

Manufacturers Continued

G. K. Turner Associates, Incorporated 2524 Pulgas Ave., Palo Alto, Calif. 94303
Ultrasonic Industries Hicksville, N.Y.
Ultra-Violet Products, Incorporated 5114 Walnut Grove Ave., San Gabriel, Calif. 91778
Unico Environmental Instruments, Incorporated 150 Cove St., Fall River, Mass. 02720
Union Ultra-Sonics Corporation 576 Lawrence, Lowell, Mass.
Unirad Corporation PO Box Drawer F, Aurora, Calif. 80010
United Aircraft Corporation New Britain Ave., Farmington, Conn. 06032 Hamilton Div.
United Technical Corporation Bradford St., West Concord, Mass. 01781
United Transformer Company 150 Varick St., New York, N.Y. 10013
U. S. Radium Corporation Hanover Ave., Morristown, N.J. 07960
United States Rubber Company 11 Speilman Rd., Fairfield, N.J. 07006
U. S. Stoneware, Incorporated PO Box 350, Akron, Ohio 44309 Sub. of Norton Co.
Universal 1138 N. Western Ave., Chicago, Ill.
Universal Electronics Company 1720 22nd St., Santa Monica, Calif. 90404
Vacuum Barrier Corporation 4 Barten Lane, Woburn, Mass. 01801
Vacuum Ceramics Incorporated Main & Thompson Sts., Cary, Ill.
Vacuum Industries, Incorporated 34 Linden St., Somerville, Massachusetts 02143
Van Waters & Rodgers 3745 Bayshore Blvd., Bribane, Calif.
Varian Palo Alto, California
Varian Eimac Division 30T Industrial Way, San Carlos, Calif.
Varian Quantum Electric Division 611 Hansen Way, Dept. T, Mountain View, Calif.
Varian Radiation Division 611 Hansen Way, Palo Alto, Calif. 94303
Vari-Light Corporation 9770 Conklin Road, Cincinnati, Ohio 45242
Vectron Labs, Incorporated 146 Selleck St., Stamford, Conn. 06902
Veeco Instruments, Incorporated Terminal Dr., Plainview, N.Y. 11803
Veeder-Root Company 28 Sargeant St., Hartford, Conn. 06102
Velmex, Incorporated PO Box 78, Colcomb, N.Y. 14469
Vidar Corporation 77 Ortega Ave., Mountain View, Calif. 94040
Voland Corporation 27 Centra Ave., New Rochelle, N.Y. 10802
Vulcan Lead Products Company 1545 W. Pierce St., Milwaukee, Wisconsin 53204
Wahmann Manufacturing Company PO Box 6883, Baltimore, Md. 21204
George T. Walker & Company, Inc. 2218 University Ave, SE, Minneapolis, Minn. 55414
Warner-Chilcott Laboratories 201 Tabor Rd., Morris Plains, N.J. 07950
Warner & Swasey Company Control Instrument Div., 32-16 Downign St., Flushing, NY 11354
Warwick Electronics 7300 N. LeHigh Ave., Chicago, Ill. 60648
Wasatch Chemical Company 2225 S. 5th East, Salt Lake City, Utah 84106
Waste King Corporation 3300 E. 50th St., Los Angeles, Calif.
Waters Company 18 14th St., SW, Rochester, Minnesota 55901
Water Saver Faucet Company 611 W. Adams St., Chicago, Ill. 60606
Watlow Electric Company of California 141 W. Hazel St., Inglewood, Calif.
Allen P. Webb 59 Pearl St., New York, N.Y.
Webcor Incorporated Electronics Div., 2431 N. Wolcott, Chicago, Ill.
Weber Dental Manufacturing Co. 2206 13th St., N.E., Canton, Ohio
Weinschel Engineering Company Clopper Rd., Gaithersburg, Md. 20760
Welbilt Corporation 57-18 Flushing Ave., Maspeth, N.Y.
Welch Scientific Company 7300 N. Linder Ave., Skokie, Ill. 60076
Wells-Gardner Electronics 2701 N. Kildare Ave., Chicago, Ill. 60639
Westinghouse Electric Corporation Lamp Parts Dept., Bloomfield, N.J.
Westinghouse Electric Corp. Major Appliance Div., 246-4th St., Mansfield, Ohio
Westinghouse Electric Corp. Specialty Electronics Group, 3 Gateway Center, Pitts, Pa.
Westinghouse Electric Corp. Scientific Equip. Dept., 7800 Susquehanna St, Pitts., Pa.
Westinghouse Electric Corp. X-ray Div., 2519 Wilkens Ave., Baltimore, Md. 21223

Manufacturers Continued

Weston Instruments EMR-Photoelectric Div., PO Box 44, Princeton, N.J. 08540
Weston Instruments PO Box 3041, Sarasota, Florida 33578 EMR-Telemetry Div.
Wheaton Glass Company Millville, N.J. 08332
Whirlpool Corporation Benton Harbor, Michigan
S. S. White Company X-ray Div., Great Neck, N.Y. 11021
Wild Heerbrugg Instruments Incorporated 564 Smith St., Farmingdale, N.Y. 11735
Wilkens-Anderson Company 4525 W. Division St., Chicago, Ill. 60651
Wilks Scientific Corporation PO Box 441, S. Norwalk, Conn. 06856
Will Scientific, Incorporated 39 Russell St., Rochester, N.Y. 14603
Will Scientific, Incorporated Bronwill Scient. Div., 277 N. Goodman St, Rochester, NY
Williams, Brown & Earle, Incorporated 904-906 Chestnut St., Philadelphia, Pa. 19108
Williams Gold Refining Company Incorporated 2960 Main, Buffalo, N.Y.
Wilmad Glass Company, Incorporated Rt. 40 & Oak Rd., Buena, N.J. 08310
Wolfe Industries 2485 Huntington Dr., San Marino, Calif. 91108
Wolverine Brass Company, Incorporated 648 Monroe Ave., NW, Grand Rapids, Mich. 49502
Worthington Biochemical Corporation Rt. 9, Freehold, N.J. 77027
Worthington Controls Company Annin & Masoneilan Operations 63 Nahatan St., Norwood,Mass
X-ray Manufacturing Corporation of America Community Dr., Great Neck, L.I., N.Y.
Xenon Corporation 39 Commercial St., Medford, Mass. 02155
Xtalonix Products 1215 Chesapeake Ave., Columbus, Ohio 43212
Yellow Springs Instrument Company Yellow Springs, Ohio 45387
Zeebac 141 4th Ave., Berea, Ohio 44017
Zeinecke and Company, Incorporated Harrisburg Expressway & Shawan Rd., Baltimore, Md.
Carl Zeiss, Incorporated 444 5th Ave., New York, N.Y. 10018
Zenith Radio Corporation 1900 N. Austin Ave., Chicago, Ill. 60639
Zirconium Corporation of America PO Box 39217, Salon, Ohio 44139

APPENDIX B

PARTIAL LISTING OF ASSOCIATIONS AND GROUPS RELATED TO VARIOUS ELECTRONIC PRODUCTS

APPENDIX B

PARTIAL LISTING OF ASSOCIATIONS AND GROUPS RELATED TO VARIOUS ELECTRONIC PRODUCTS[a]

Aerospace Electrical Society 817 S. Long Beach Blvd., Compton, Calif. 90221
Airways Engineering Society Ste. 444, Shoreham Bldg., 806 15th St. NW, Wash. DC 20005
Alcort Sailfish-Sunfish Class PO Box 1345, Waterbury Conn. 06720
American Academy of Phys. Medicine Rehabilitation 30 N. Mich. Ave., Chicago, Ill. 60602
American Boat & Yacht Council 420 Lexington Ave., New York, NY
American Boat Builders & Repairers Asso. Inc, 2488 Grand Concourse, Bronx,NY 10458
American Crystallographic Asso. PO Box 2038, Pittsburgh, Pa. 15230
American Electroencephalographic Society, U. of Mich. Med. Center, Ann Arbor, Mich.
American Home Lighting Institute 360 N. Michigan Ave., Chicago 1, Ill.
American Hospital Association 840 N. Lake Shore Dr., Chicago, Ill 60611
American Institute of Food Distribution 420 Lexington Ave, New York, NY 10017
American Institute of Industrial Engineers 345 E. 47th St., New York 17, NY
American Institute of Ultrasonics in Medicine 4833 Fountain Ave, LA, Calif. 90029
American Machine Tool Distributors Association 1500 Mass. Ave, NW, Wash. DC 20005
American Physical Therapy Association 1740 Broadway, New York, NY 10019
American Power Boat Association 415 Burns Dr., Detroit, Mich. 48214
American Radio Importers Association 663 Fifth Ave, New York, NY 10001
American Radio Relay League 225 Main St., Newington, Conn. 06111
American Research Bureau Ammendale Rd., Beltsville, Md. 20705
American Saliling Council 420 Lexington Ave., New York, NY 10017
American School Food Service Association, PO Box 8811, Denver 10, Colorado
American Shortwave Listeners Club 628 S. Jefferson, Perry, Fla.
American Society of Safety Engineers 5 N. Wabash Ave., Chicago, Ill. 60602
American Welding Society 345 E. 47th St., New York, NY 10017
Aqua-Cat Catamaran Sailing Association PO Box 297, S. Norwalk, Conn.
Armed Forces Comm. & Electronics Assn. 1725 Eye St, NW, Wash., DC.
Association of Edison Illuminating Companies 51 E. 42nd St., New York, NY
Association of Electronic Distributors 1548 N. Highland Ave., LA 28, Calif.
Association of Electronic Manufacturers, Inc. Cen Div, 100 S. Wacker Dr, Chic, Ill.
Association of Electronic Manufacturers, East. Div, 261 Broadway, New York 17, NY
Association of Fed. Comm. Consulting Engineers 527 Munsey Bldg, Wash, DC 20004
Association of Institutional Distributors 541 National Press Bldg, Wash, DC 20004
Association of Maximum Service Telecasters 1735 DeSales St, NW, Wash, DC 20036
Better Light Better Sight Bureau 750 Third Ave, New York 17, NY
Boat Owners Council of Amer. 333 N. Michigan Ave., Chicago, Ill 60601
Boating Industry Association 333 N. Michigan Ave, Chicago, Ill. 60601
Broadcast Pioneers 589 Fifth Ave, New York 17, NY
Broadcasting Foundation of America 52 Vanderbilt Ave, New York 17, NY
Clear Channel Broadcasting Service 1625 I St. NW, Cafritz Bldg, Wash, DC 20006
Consumers Union of U. S. 256 Washington St., Mt. Vernon, NY 10550
Cooperative Food Distributors of America 140 S. Dearborn St, Chicago, Ill. 60603
Council on Consumer Information 15 Gwynn Hall, U. of Mo., Columbia, Mo. 65201
Council on Hotel, Restaurant & Institutional Education Statler Hall, Ithaca, NY
Cruising Club of America 90 John St, New York, NY 10038
Cutting Die Institute 1740 Bd. of Trade Bldg, Chicago 4, ILL.
Cutting Tool Manufacturers Association 1216 Penobscot Bldg, Detroit 26, Mich.
Department of Home Economics 1201-16th St, NW, Wash. DC
Edison Electric Institute 750 Third Ave, New York, NY

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[a] Additional information available on McBee Keysort Cards.

Partial Listing Continued

Electric Consumers Information Committee 2000 Fla. Ave, NW, Wash, DC.
Electric Heating Association 1000 16th St, NW, Washington, D.C.
Electric Tool Institute 1718 Sherman Ave, Evanston, Ill.
Electrical Apparatus Service Association 7730 Carondelet Ave, St. Louis, Mo.
Electrical Equipment Representatives Association 1675 Fifth St, Clermont, Fla.
The Electrification Council 750 Third Ave, New York, NY 10017
Electrochemical Society 30 E. 42nd St., New York 17, NY
Electrolysis Society of America 155 W. 46th St., New York, NY 10036
Electron Microscope Society of America Olin Hall, Cornell U., Ithaca, NY 14850
Electronic Industries Association 1721 DeSales St, NW, Wash, DC.
Electronic Representatives Association 600 S. Michigan, Chicago, Ill. 60605
Electronic Sales-Marketing Association 1923-81st St., Brooklyn, NY 11214
Electronics Manufacturers Association 55 W. 42nd St., New York 36, NY
Equipment and Tool Institute 318 Henrietta St, Kalamazoo 5, Mich.
Fast Food Magazine 630 Third Ave, New York, NY 10017
Federal Aviation Administration Off. Inf. Serv, Dept. of Transportation, Wash, DC 20590
Federated Fishing Boats of N. ENG. & N.Y. Adm. Bldg, Fish Pier, Boston, Mass. 02210
Food and Nutrition Board NRC 2101 Constitution Ave, Wash 25, DC
Food Facilities Consultants Society 1517 N. 2nd St, PO Box 1238, Harrisburg, Pa 17108
Food Merchandisers of America 1511 K Street, NW, Wash., DC 20005
Food Packaging Council 520 N. Michigan Ave, Chicago 11, Ill.
Food Service Equipment Dealer 95 E. Putnam Ave, Greenwich, Conn. 06830
Food Service Equipment Industry 332 S. Michigan Ave, Chicago 4, Ill.
Food Service Executives' Association 3801 Mt. Vernon Ave., Alexandria, Va. 22305
Forest Industries Radio Communications PO Box 5153, Eugene Oregon 97405
Home Economists in Business 33 Narrangansett Dr., St. Louis 24, Mo.
Home Furnishings Industry Committee Southern Furniture Exposition Bldg, High Pt, NC
Home Improvement Products Association 2217 Tribune Tower, Chicago, Ill. 60611
Home Products Safety Council 1725 K Street, NW, Suite 605, Wash. 6, DC
Hospitality Publications 5 S. Wabash Ave, Chicago, Ill. 60603
Illuminating & Allied Glassware Manufacturers Assn 816 Empire Bldg, Pittsb, Pa 15222
Illuminating Engineering Research Institute 345 E. 47th Street, New York, NY 10017
Illuminating Engineering Society 345 E. 47th St, New York, NY 10017
Incandescent Lamp Manufacturers Association 760 S. 13th St, Newark, NJ
Industrial Research Institute 100 Park Ave, New York 17, NY
Institute of Electrical & Electronics Engineers 345 E. 47th St, New York, NY 10017
Institute of Food Technologists 221 N. LaSalle St, Chicago, Ill. 60601
Institutional Food Distributors of America 1511 K Street, NW, Wash, DC 20005
Institutional Foodservice Manftrs Assn United of Amer Bldg, 1 E wackerDr, Chic, Ill.
Institutions Magazine of the Service World 1801 Prairie Ave, Chicago, Ill 60616
Instrument Society of America Penn-Sheraton Hotel, 530 William Penn Pl, Pitts, Pa 15219
Inter-Lake Yachting Association 22911 Buckingham Rd., Dearborn, Mich.
International Amateur Radio Union 225 Main St, Newington, Conn. 06111
International Association of Electrical Inspectors 201 E. Erie St, Chicago,Ill. 60611
International Assn. of Electrical Leagues 155 E. 44th St, New York 17, NY
International Assn, of Milk,Food & Environm. Sanitarians PO Box 437, Shelbyvill, Ind.
International Assn. of Tool Craftsmen PO Box 471 Rock Island, Ill.
International Brotherhood Of Electrical Workers 1200 15th St, NW, Wash 5, DC
International Lightning Class Assn. 808 High St, Worthington, Ohio 43085
International 5.5 Metre Class Assn. of USA 1600 Hamilton St, Philadelphia 30, Pa.
International Radio & TV Society 444 Madison Ave, New York 22, NY
Industrial Safety Equipment Association 630 Third Ave, Suite 400, New York 17, NY

Partial Listing Continued

International Society of Food Service Consultants PO Box 13559, Gainesville, Fla 32603
International Star Class Yacht Racing Assn. 51 E. 42nd St., New York, NY
Intl. Union of Electrical Radio & Machine Workers 1126 16th St, NW, Wash 6, DC
Joint Industry Board of Electrical Industry 420 Lexington Ave, New York 17, NY
Joint Technical Advisory Committee 345 East 47th St, New York, NY 10017
Lamp and Shade Institute of America 15 E. 26th St, New York, NY 10010
Manufacturers' Agnets for Foodservice Industry 1517 N. 2nd St, Harrisburg, Pa
Manufacturers of Illumination Products 158-11 Jewel Ave, Flushing, NY 11365
Metal Cutting Tool Institute 405 Lexington Ave,New York 17, NY
Midget Ocean Racing Club PO Box 4092, Grand Central Station, New York, NY
Military Affiliate Radio System The Pentagon, Rm. 5B960, Wash. 25, DC
National Alliance of Television & Electronic Service Assns. 5906 S Troy St, Chic, Ill.
National Appliance & Radio-TV Dealers Assn, 1319 Merchandise Mart, Chicago, Ill.
National Association for Specialty Food Trade 11 W. 42nd St, New York, NY 10036
National Association of Broadcasters 1771 N Street, NW, Wash, DC 20036
National Assn. of Educational Broadcasters 1346 Conn. Ave, NW, Wash 6, DC Off. Res&Dev.
National Association of Electric Companies 1200-18th St, NW, Wash 6, DC
National Assn. of Electrical Distributors 600 Madison Ave, New York, New York 10022
National Ass. of Engine & Boat Manufacturers 537 Steamboat Rd, Greenwich, Conn. 06830
National Association of FM Broadcasters Station KITT, US Grant Hotel, San Diego, Cal.
National Assn. of Food Equipment Manufacturers 333 N. Michigan Ave, Chicago, Ill 60601
National Assn. of Home Economics Supervisors 1010 Vermont Ave, NW, Wash, DC
National Assn. of Independent Food Retailers 434 W. Eight Mile Rd, Detroit 20, Mich.
National Assn. of Marinas and Marine Dealers PO Box 6581, Tee St Station, NW, Wash, DC
National Assn. of Radiotelephone Systems Rm 314, 1225 Conn. Ave, NW, Wash, DC 20035
National Automatic Vendors' Trade Assn. 5876 Smiley Dr, Culver City, Calif.
National Boat Association PO Box 282 Destin, Fla.
The National Broadcasting Company Thirty Rockefeller Plaza, New York, NY 10020
National Coin Machine Distributors Assn. 30 N. LaSalle St, Chicago 2, Ill.
National Community TV Association 535 Transportation Bldg, Wash, DC
National Consumers Committee for Research & Education 1029 Vermont Ave,NW, Wash, DC
National Consumers League 1029 Vermont Ave, NW, RM 203, Wash, DC 20005
National Council of Yacht Clubs Address Unknown
National Dietary Foods Association 6166 Hamilton Ave, PO Box 24037, Cincinnati, Ohio
National Electrical Manufacturers Assn. 155 East 44th St., New York, NY 10017
National Electronic Distributors Assn. 343 S. Dearborn St, Chicago 4, Ill.
National Electronics Conference 228 N. LaSalle St., Chicago 1, Ill.
National Food Distributors Assn. 333 N. Michigan Ave, Chicago, Ill. 60601
National Food, Drug & Cosmetic Assn. of Mnftrs. & Distrbtrs. 3560 Broadway, NY, NY
National Food Service Association PO Box 1932, Columbus, Ohio 43216
National Home Fashions League 2100 Stemmons Freeway, Dallas, Texas 75207
National Home Fashions League, Inc. 2005 Dallas Trade Mart, Dallas, Texas 75207
National Housewares Manufacturers Assn. 1130 Merchandise Mart, Chicago, Ill. 60654
National Mobile Radio System 425 E. 7th Street, Tucson, Arizona
National Safe Boating Association 333 N. Michigan Ave, Chicago, Ill. 60601
National Safe Boating Week Committee US Coast Guard Headquarters, Wash, DC 20226
National Safety Council 425 N. Michigan Ave, Chicago, Ill. 60611
National Tool, Die and Precision Machining Assn. 1411 K St, NW, Wash, DC 20005
National Welding Supply Association 1900 Arch St, Philadelphia 3, Pa.
North American Multi-Hull Sailing Assn. PO Box 974, Darien, Conn.
North American Yacht Racing Union 37 W. 44th St, New York, NY 10036
Outboard Boat Manufacturers Assn. 33 N. Michigan Ave, Chicago, Ill.
Outboard Boating Club of America 333 N. Michigan Ave, Chicago, Ill. 60601

Partial Listing Continued

Outboard Motor Manufacturers Assn. 333 N. Michigan Ave, Chicago, Illinois 60601
Predicasts, Inc. 10550 Park Lane University Circle, Cleveland, Ohio 44106
Pioneer TV & Electronic Technicians Society 39 Treaty Elm Lane, Haddonfield, NJ
Purchasing Agents of the Electronic Industry Box 62, Rosedale, NY
Radio & Television Research Council 50 Maple Pl, Manhasset, L.I., NY Home Test. Inste.
Radio Club of America (RCA) 20 W. 44th St, New York, NY 10036
Radio Technical Commission for Aeronautics 2000 K St, NW, Washington, DC 20006
Railway Supply Association 332 S. Michigan Ave, Suite 950, Chicago4, Ill.
Ray Proof Corporation 50 Keeler Ave, Norwalk, Conn. 06856
Research & Development Associates US Army Natick Laboratories, Natick, Mass. 01762
Rocket Cruising Association 337 Main St, West Newbury, Mass.
Scientific Apparatus Makers Association 1140 Conn. Ave, NW, Wash, DC 20036
Snipe Class International Racing Association 655 Weber Ave, Akron, Ohio 44303
Society for Nondestructive Testing 914 Chicago Ave, Evanston, Ill. 60402
Society of Motion Picture & TV Engineers 9 E. 41st St, New York, NY 10017
Society of Wood Science & Technology PO Box 2004, Madison 5, Wisconsin
Solid Carbide Tool Institute 1015 Chestnut St, Philadelphia 7, Pa.
Special Industrial Radio Service Association 1750 Penn. Ave, NW, Wash, DC 20006
Stanford Research Institute 1611 N. Kent, Arlington, VA. 22203
Station Representatives Association 366 Madison Ave, New York 17, NY
Television Information Office 745 Fifth Avenue New York, NY 10022
Tiger Cat Association 206 Pleasant St, Milton, Mass. 02186
Tool and Die Institute 2345 N. Laramie Ave, Chicago 39, Ill.
Tourist Court Journal Temple, Texas 76501
Ultrasonic Manufacturers Association 271 N. Ave, New Rochelle, NY 10801
United Electrical Radio & Machine Workers of America 11 E. 51st St, New York, NY
United States 420 Association Nine Rockefeller Plaza, Rm 2229, New York, NY 10020
United States Coast Guard Washington, D. C. 20591
United States International Sailing Assn. 37 W. 44th St, New York, NY
United States-Japan Trade Council 1000 Conn, Ave, NW, Wash, DC
United States Power Squadrons PO Box 510, 96 West Street, Englewood, NJ 07631
Volume Feeding Management 95 E. Putnam St, Greenwich, Conn. 06830
Western Electronic Manufacturers Assn. 3600 Wilshire Boulevard, Los Angeles, Calif.
Yacht Architects and Brokers Association Address Unknown
Yachting Club of America Sunrise Profressional Bldg., Fort Lauderdale, Fla.

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Jesse Y. Harris:
ELECTRONIC PRODUCT INVENTORY STUDY
U.S. Department of Health, Education,
and Welfare, Public Health Service
Publication Number BRH/DEP 70-29 (November 1970),
71 pp. (limited distribution).

Accession No.

ABSTRACT: This report presents the results of a study conducted during 1969 to determine the current and predicted national inventories of electronic products that may emit hazardous radiation. Inventories, production rates, and dollar market values are estimated to provide a general indication of the magnitude of electronic product use. Market data for various types of products which emit ionizing or non-ionizing radiation are discussed in detail, growth

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KEYWORDS: Electronic products; Inventory; Market study; Color TV; Microwave ovens; X-ray equipment; Lasers.

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DIVISION OF ELECTRONIC PRODUCTS

List of Publications

(continued from inside of front cover)

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RH/DEP 70-11	Leakage Variations from Microwave Ovens (June 1970) (PB 192 042)
RH/DEP 70-12	The Effect of Instrument Averaging Time on Microwave Power Density Measurements (June 1970) (PB 192 322)
RH/DEP 70-13	Variability in the Automatic Processing of Medical X-ray Film (June 1970) (PB 192 702)
RH/DEP 70-14	Simple X-ray Detection Instruments for Television Service Technicians (June 1970) (PB 192 377)
RH/DEP 70-15	A Partial Inventory of Microwave Towers, Broadcasting Transmitters, and Fixed Radars by States and Regions (June 1970) (PB 193 542)
H/DEP 70-16	Near Field Instrumentation (July 1970) (PB 192 748)
H/DEP 70-17	Radiation Safety Surveys of X-ray Facilities Within the Federal Health Programs Service (July 1970) (PB 192 957)
H/DEP 70-18	Bremsstrahlung Production (July 1970) (PB 192 888)
H/DEP 70-19	Radiation Safety Surveys of X-ray Facilities Within the Bureau of Prisons During 1968 (July 1970) (PB 193 222)
H/DEP 70-20	Investigation of the Response of the Microlite 287 Probe to Microwave Fields (August 1970) (PB 193 223)
H/DEP 70-21	Evaluation of an X-radiation Dosimetry Service for Home Television Receivers (August 1970) (PB 193 487)
H/DEP 70-22	Report of Tests for X-ray Emission from a Rayotron® Electrostatic Generator and Particle Accelerator (August 1970) (PB 193 522)
H/DEP 70-23	Microwave Oven Test Load Evaluation and Determination of Internal Microwave Energy Distribution (August 1970) (PB 193 804)
H/DEP 70-24	In-Plant Survey of Television Receivers for X-radiation Emission Capability (September 1970) (PB 194 316)
H/DEP 70-25	Laboratory Testing and Evaluation of Microwave Ovens (October 1970) (PB 194 484)
H/DEP 70-26	Electronic Product Radiation and the Health Physicist - Health Physics Society Fourth Annual Midyear Topical Symposium (October 1970)
H/DEP 70-27	A Study of Head and Neck Exposure from Polytomography (November 1970)
H/DEP 70-28	Present Federal Control of Health Hazards from Electronic Product Radiation and Other Types of Ionizing Radiation (November 1970)
H/DEP 70-29	Electronic Product Inventory Study (November 1970)